Federal Aviation Administration

Research, Engineering and Development Advisory Committee

Financing the Next Generation Air Transportation System

April 2006

Executive Summary

The FAA Research, Engineering and Development Advisory Committee (REDAC) established the Financing the Next Generation Air Transportation System Working Group (FNGATSWG) to investigate options for financing Next Generation ATS as outlined by the National Plan and defined by the Joint Planning and Development Office (JPDO) of the FAA, TSA, and NOAA, their parent departments, NASA, DoD, and OSTP. The goal is to identify and develop the available options for funding and financing research and development, capital projects, and operations cost of the Next Generation ATS. The effort focused on the FY2006 through 2025 time frame. The working group considered the levels of funding required, possible revenue sources, and techniques for financing. It considered opportunities to reduce costs through introduction of advanced technologies and techniques or outsourcing, but did not consider issues such as labor contracts, privatization or major structural changes in the FAA organization.

The working group:

1. Established in cooperation with the JPDO and other elements the government cost estimates in general and the FAA in particular. Others are preparing the related industry costs for NGATS implementation:
    - A 2006-2025 baseline cost estimate and projected funding estimate for developing, implementing, and operating the planned NAS if the NGATS is not implemented (Status Quo option) and the current revenue scheme were continued;
    - A corresponding 2006-2025 cost estimate for developing, implementing and operating the NAS 2006 through 2010 and then converting to NGATS between 2010 through 2025 (NGATS Option).
2. Identified the options for funding the resulting system cost through user fees or user taxes supplemented by a general fund contribution.
3. Developed a set of criteria for assessing these options.
4. Defined financing options to be used in the event that the modernization funding requirements vary significantly from year to year .
5. Considered approaches to implementing the NGATS that the industry and Congress would support.

The following findings summarize our efforts:

- In both the Status Quo and NGATS scenarios, funding the FAA R&D, F&E, Operations, and AIP activities is estimated to require about $15 billion annually in 2005 dollars. FAA operations costs dominate these figures.

- The Status Quo scenario will provide insufficient increases in capacity to meet the growing demand. The Status Quo scenario is therefore not an acceptable option other than for analysis purposes. The NGATS provides the needed capacity and reduces total funding requirements by inserting technologies that provide the required increase in capacity with lower operation cost.

- The continued use of the current FAA trust fund revenue rates will lead to approximately a $1 billion shortfall over the next several years without an increase in the General Fund contribution. This projection assumes a General Fund contribution to the FAA budget on the order of 20%.

- The FAA relies on the current NASA aeronautics R&D program as the principal source of the technologies needed to provide the nearer-term NGATS aviation system capacity and operations cost reductions. The current restructuring of the NASA program introduces uncertainty in this reliance. Refocusing NASA efforts on lower Technology Readiness Levels (TRL 1, 2, & 3) is a particular source of concern because it shifts a greater R&D transition burden to the FAA. To accommodate this reduction in NASA support for transition will require an additional approximately $100 million annually in FAA R&D funds. If the current NASA effort were abandoned completely, the FAA would require a further $100-150 million annually in FAA research and development funds. More importantly, NGATS implementation would be delayed, probably by five years, while the FAA reestablishes the infrastructure needed to accomplish the work. This delay in NGATS would have a severe long-term impact on the FAA operations budget.

- The alternatives for closing the near term funding gap are to:
  - Significantly reduce Operations, F&E, R&D, and/or AIP costs,
  - Increase user taxes and fees,
  - Increase the General Fund contribution,
  - Introduce some sort of financing (borrowing) that bridges the near term gap and repays it with longer term surpluses, or
  - Some combination of these.

- The FAA is pursuing substantial cost reductions in operations and other costs, for example, the outsourcing of Flight Service operations. The working group identifies other cost saving opportunities. A composite annual cost savings on the order of $500 million is a reasonable objective for these cost reduction activities.

- The distribution of taxes/fees between user groups and the level of the general fund contribution are the basic problems to be solved. Each user group has a different model for determining the share of FAA costs it should pay. Once the shares are determined, the method of tax or fee collection may vary from user to user at a level to meet their allocated share.

- There are an infinite number of user fee/tax options with or without a General Fund contribution. The working group has identified four:
  - Current revenue approach with rate adjustments
  - Fuel tax or fee only
  - Weight/distance fee
  - Distance fee

These have been analyzed against a set of developed criteria.. No one of them is expected to be acceptable by itself to the entire community. Defining a hybrid to create an approach that is acceptable to aviation industry groups will be required.

- Successfully transforming the NAS into a Next Generation Air Transportation System (NGATS) that meets America's future aviation needs is a demanding project that will require twenty years of consistent and stable funding, management, and oversight to be successfully and efficiently completed. All the while, the system must safely and efficiently provide services every day to satisfy an ever-expanding demand for air transportation.

- On the financial side, the operation and transformation of the NAS into the NGATS will require about $300 billion or $15 billion each year in constant 2005 dollars. While the budget will be managed to minimize year-to-year variations in revenue and expenses, some will occur. Hence, a flywheel is required to overcome these variations.

- On the program side, a process must be deployed that ensures successful and cost effective development and implementation of the NGATS. It must provide a consistent management and oversight mechanism and a mechanism for measuring ongoing cost, performance, and progress toward transformation of NAS to NGATS

- The Working Group has identified **Six Engines for Success** needed to meet these objectives:

    - First is the **Leader**. The twenty-year NGATS implementation period will require three to five leaders to over the life of the project. The selection and development of these leaders is probably the most important element to NGATS success. In addition to their being smart and hard working people they must know the NAS and the NGATS and the transformation between them. They must be innately people of vision and public purpose.

    - A **Revenue Engine** that raises the required $15 billion each year through collection of user fees/taxes and a contribution from the General Fund. It is assumed that this engine is a variant of one or more of the funding approaches discussed in this report.

    - A **Financial Stability Engine** that accommodates year-to-year variations in the revenue or expenses. The selected Financial Stability Engine could be any one of an infinite set of variations but will always be some combination of either reserve accounts (e.g. The Aviation Trust Fund) or borrowing authority or both.

    - A **Program Engine** that provides the mechanism for consistent, stable program management of development, production, implementation, and initial operation of the sub-systems that transform the NAS into the NGATS.

- A **Planning, Management, And Oversight Engine** that provides the mechanism for maintaining the NGATS implementation plan, managing its accomplishment, providing for its oversight by the FAA, the aviation community, the Congress and the Administration.

- A **Metrics Engine** that facilitates the measurement of the on-going performance of the NAS and the progress toward its transformation to the NGATS. It should be provide transparent measurements of specific metrics at any given time and the incremental change in that metric over time. It includes measurements of Safety, Capacity, Environmental Impact, FAA Costs, FAA Productivity, and User Benefits as a minimum.

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INTRODUCTION

Purpose

The FAA Research and Development Advisory Committee (REDAC) established the Financing he Next Generation Working Group (FNGATSWG) to define and evaluate options for funding and financing the Next Generation Air Traffic System (NGATS) as outlined in the National Plan. The FAA Joint Planning and Development Office (JPDO) in consultation with NASA, DoD, OSTP, TSA, NOAA, and their parent departments are further defining the NGATS.

The Working Group addressed government funding requirements in general and FAA funding requirements specifically, opportunities for cost reduction, alternative options for funding, and alternative methods for financing NGATS over its twenty-year implementation period. The FAA's four budget accounts – Operations, Facilities and Equipment (F&E), Airport Improvement Program (AIP), and Research, Engineering, and Development (RED) are projected for both a baseline Status Quo scenario and an NGATS scenario. The capital accounts (F&E, AIP and RED) are currently funded by appropriations from the Airport and Airway Trust Fund, which is supported by user fees and taxes. The Operations account is funded with both General Fund and Trust Fund appropriations. The related industry costs are being defined by others.

Approach

The Terms of Reference, which defined the working group's charter, appear as Appendix A of this report**.** Our work has proceeded in the following steps:

<u>Step 1 The Status Quo</u>. We began by developing a baseline scenario of projected costs and funding profile for a "Status Quo Scenario" between 2006 and 2025 assuming that NGATS is not implemented.

Note that the Status Quo scenario is presented here for analytical purposes only since the current approach to air traffic control and management in use in the United States cannot be scaled up to handle the projected growth in traffic. Capacity limitations are geographically sensitive. Demand is currently exceeding capacity in several places including Chicago and New York. The severity of this problem is expected to grow so that in the 2010 to 2020 time frame the demand will exceed the capacity in enough places to have a significant impact on the overall U.S. economy. One of the major NGATS objectives is to provide the capacity to meet the growth in demand.

<u>Step 2 Opportunities to Significantly Reduce Costs</u>. We then considered what cost reductions are possible in either the Status Quo or the NGATS scenario. The dominant cost category by far is Operations cost, so significant cost reductions require reductions in Operations cost. Cost reduction mechanisms for ATC Operations are of two general types: cost reduction achieved by reducing labor expense (e.g., by better management of overtime or sick leave), and cost reduction achieved by increasing labor productivity (e.g. by better training or by better automated decision aids). The first category is

currently being addressed by the ATO organization. The second category (increased productivity) is within the purview of the Working Group and is considered herein. The NGATS is expected to be a cost reducing mechanism (by increasing the productivity of the controller work force). We also consider outsourcing as a potential cost reduction mechanism available for ATC Operations support costs (communications, surveillance, and facilities maintenance). Outsourcing of the Flight Service Stations is under way. ***Note that the Working Group did not consider privatizing the FAA, major FAA restructuring or industrial issues including labor management relations and employee salaries***.

Step 3 NGATS Cost. Next, we assumed that the NGATS is completed as defined by the National Plan and implemented by 2025.
The first questions are: "How much will the NGATS cost to implement?", "What is the associated spending profile?" There was no formal implementation scenario or overall NGATS cost estimate as we began our considerations. We spent several months working with the JPDO developing a "Roll Out" plan for implementing the defined NGATS capabilities over 20 years; a schedule of Research and Development funded activities necessary to support their development; a schedule of Facilities and Equipment funded activities necessary to support their implementation; and a schedule of Operations funded activities necessary to integrate them into the operating National Airspace System (NAS) to form the NGATS. We then worked with the JPDO and the FAA Air Traffic Organization Planning and Finance Offices to estimate the costs of these activities and to develop a profile of the required funding.

Step 4 NGATS Funding. We next considered three funding categories: General Funds, fees or taxes collected on the basis of cost of service required from the FAA, and fees or taxes collected on the basis of the value of service received by the aircraft operator.

The General Fund contribution to the FAA budget has varied over a wide range historically. In 2005 it was about 20% and in 2006 about 18%. The rationale for a General Fund contribution is that a safe, efficient, air transportation system benefits the economy as a whole, that it is consistent with American values to make the airways affordable for as many users as practical, and that the military services make substantial use of the ATC system.

The Cost of Service funding category includes fees or taxes, which are collected on the basis of operations or of flight hours or miles. Landing fees, segment fees collected on a per aircraft basis, and charges on a per interaction basis are examples. Note that these mechanisms take no account of the size of the aircraft, so they are perceived as especially burdensome for general aviation. This kind of funding is in accordance with the business and accounting principle that each activity should cover the cost that it imposes on the service provider.

The Value of Service funding category includes fees or taxes which are proportional to the benefit derived from the system. Examples are the ticket tax, fuel tax, and weight-distance fees (which are widely used in other countries). These fees and taxes draw heavily on the airlines (and thus, their customers, the airline passengers) and the airfreight operators. The pragmatic justification for this class of fee and tax is it draws on that part of the aviation community which receives the greatest economic benefit from and has the economic size to afford a significant contribution to the cost of building and operating the nation's aviation infrastructure.

Step 6 Implementing and Financing the NGATS. Finally we considered the process of implementing the NGATS over a twenty-year period and the necessary elements to managing and financing NGATS implementation.

STATUS QUO SCENARIOS

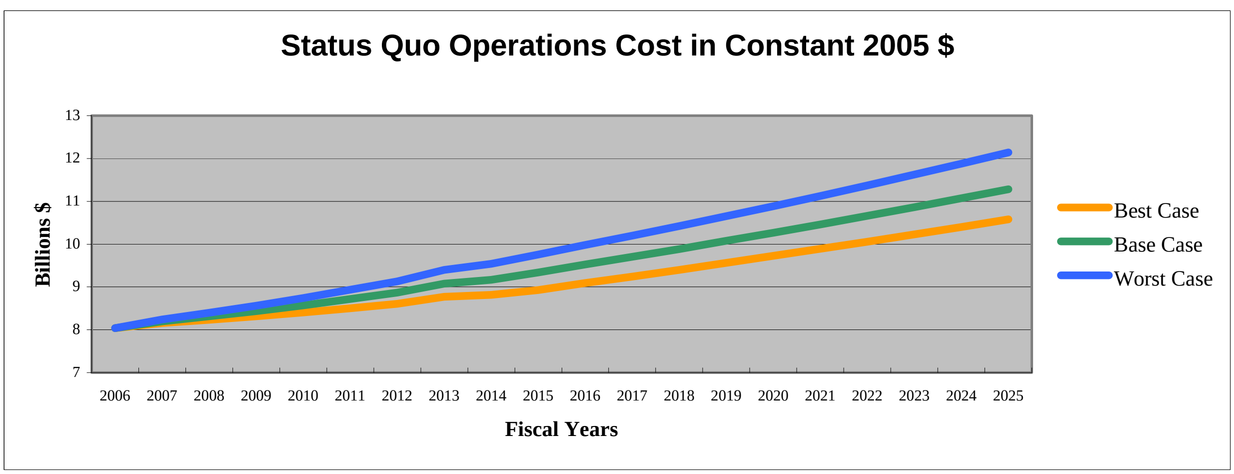
We begin by considering a continuation of the current funding approach and the continuation of the OEP effort, without implementation of NGATS, that we have labeled the Status Quo Scenario. To establish the set of likely status quo scenarios we have reviewed a number of sources including FAA forecasts, GAO studies, and industry association reports and formulated the scenarios to be further analyzed.

The Status Quo scenarios project the costs of continuing the current plans for operations and improvements of the National Airspace System (NAS) from 2006 through 2025 against a projection of the expected revenue using the current Aviation Trust Fund revenue scheme. These results will later be compared with projections which assume the development, implementation, and operation of the Next Generation Air Transportation System (NGATS).

Operations Cost

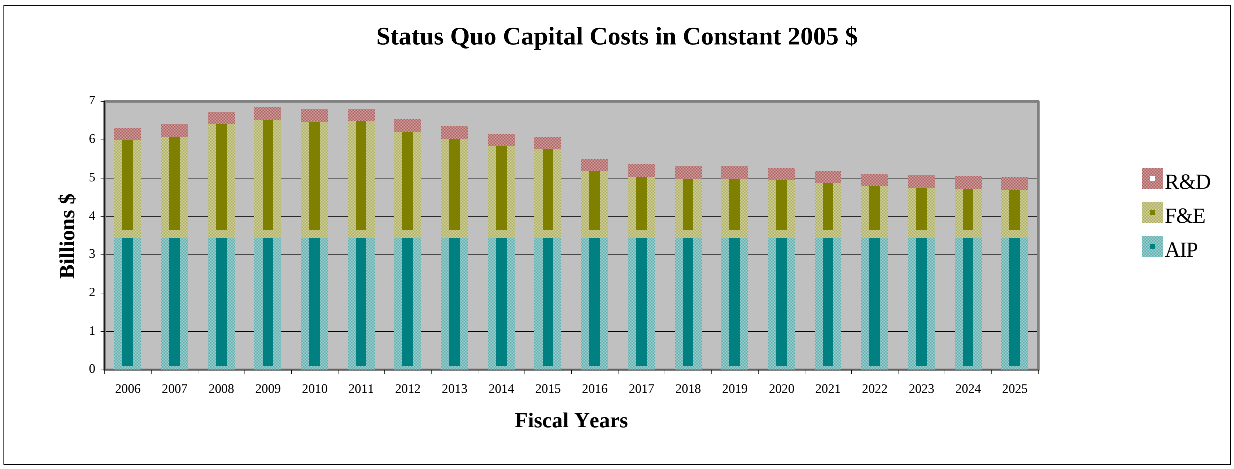
The cost scenario assumes the Operation costs will rise with the number of operations. The number of enroute IFR operations projected in the FAA 2005 forecast is used as a basis through 2016 and is estimated to grow at a slightly lower rate from 2017 through 2025. Three levels of productivity improvement assumptions are then used to create three cases:

> The Best Case assumes a productivity growth of 1% per year in years 2006 through 2015 and 0.5% per year in years 2016 through 2025, resulting in a 15% reduction in cost growth over the twenty year period,
>
> The Base Case assumes a productivity growth of 0.5% per year in years 2006 through 2015 and 0.25% per year in years 2016 through 2025, resulting in a 7.2% reduction in cost growth over the twenty year period, and
>
> The Worst Case assumes no growth in productivity, resulting in no reduction in cost growth over the 20-year period.



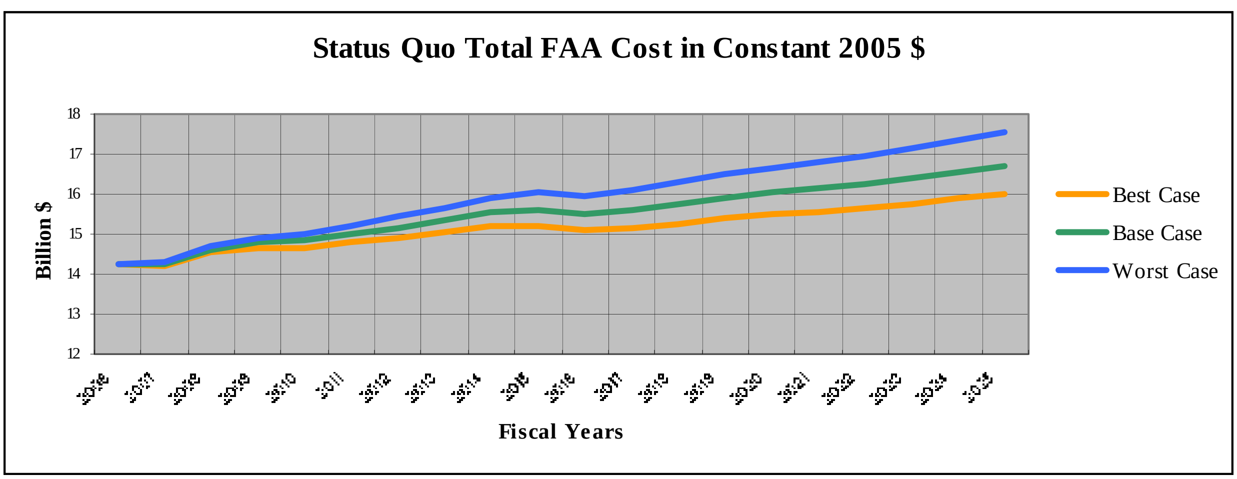
Capital and R&D Costs

AIP funding is projected constant at $3.55 billion per year (current level); F& E funding at the ATO Planning and Finance Offices' projected levels; and R&D funding is projected constant at $125 million per year over the period. The F&E costs decrease in the out years is probably exaggerated in that the out year requirements have not yet been clearly identified. The R&D costs assume that NASA will continue to fund the major portion of the Air Traffic Management research and development. (Note: All costs are in constant 2005 $.)



Total FAA Costs

The total Status Quo Scenario cost used here as the baseline cost is the sum of all of these costs.

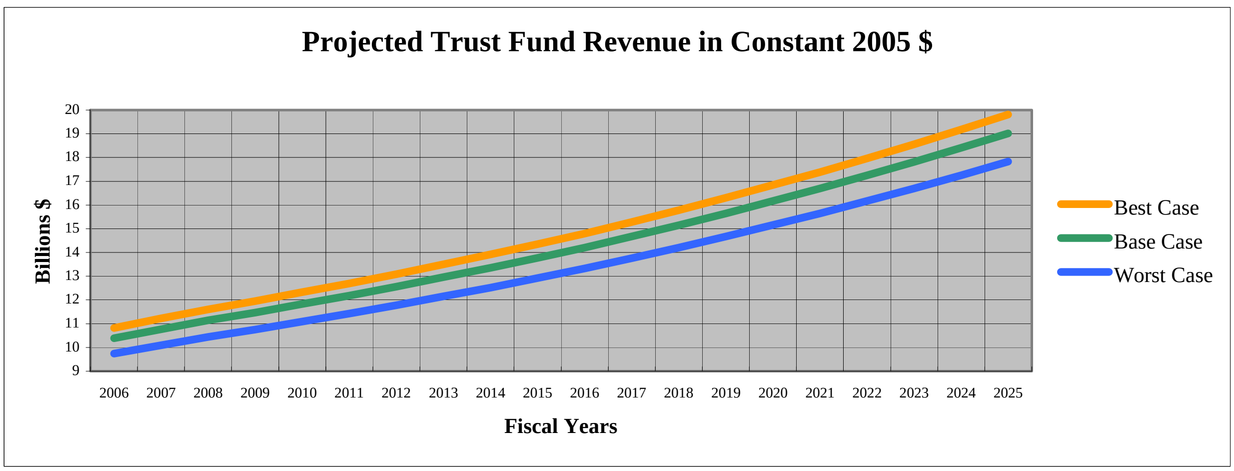


Trust Fund Contribution

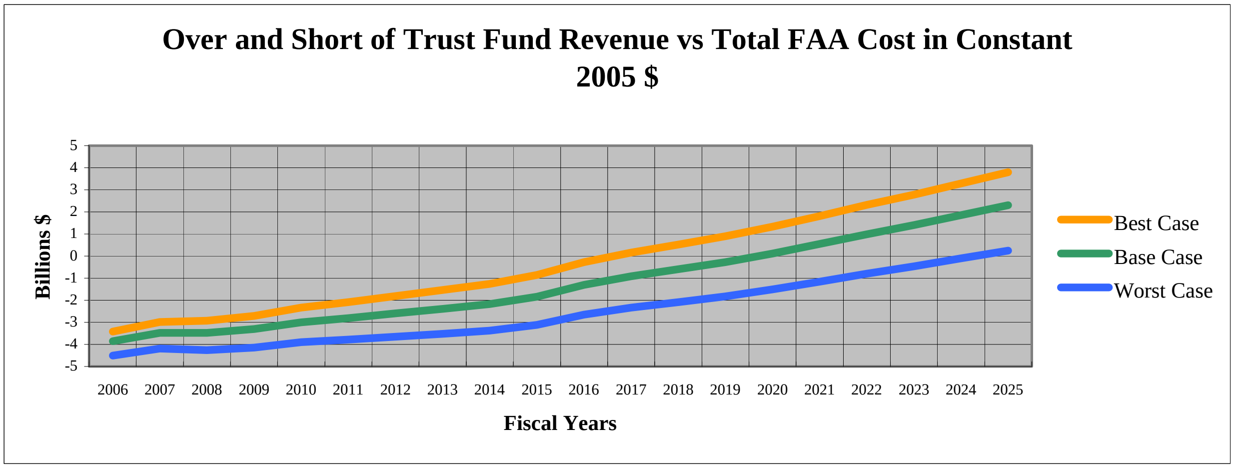
The Best Case revenue scenario is the FAA Forecast of Aviation Trust Fund revenue (including interest) between 2006 and 2015 and it is extended between 2016 and 2025 by the average growth rate between 1999 and 2015. However, the FAA trust fund revenue estimates published for the past several years have been optimistic given variations in ticket prices and the general estimating uncertainties.

Trust Fund Revenue (including interest) Actual vs Forecasted	2000	2001	2002	2003	2004	2005	Average
Forecasted (President's Budget)	10.0	10.4	12.2	10.3	10.9	11.1	10.8
Actual	10.5	10.1	9.9	9.3	9.7	10.7	10.0
Variance #	0.5	-0.3	-2.3	-1.0	-1.2	-0.4	-0.8
Variance %	5.0%	-2.9%	-18.9%	-9.7%	-11.0%	-3.6%	-6.9%

Therefore we use the FAA forecast as the Best Case and our Worst Case discounts the FAA forecast 10% per year (the average variance between the FAA's forecast and actual revenue in 2003-2004) over the period and the Base Case discounts the FAA forecast by 4% over the period (the average variance between 2000-2005, excluding 2002, which was an extreme case due to the effect of the 9/11 attacks).



The annual over and short of the Trust fund revenue and the total FAA costs are projected below.

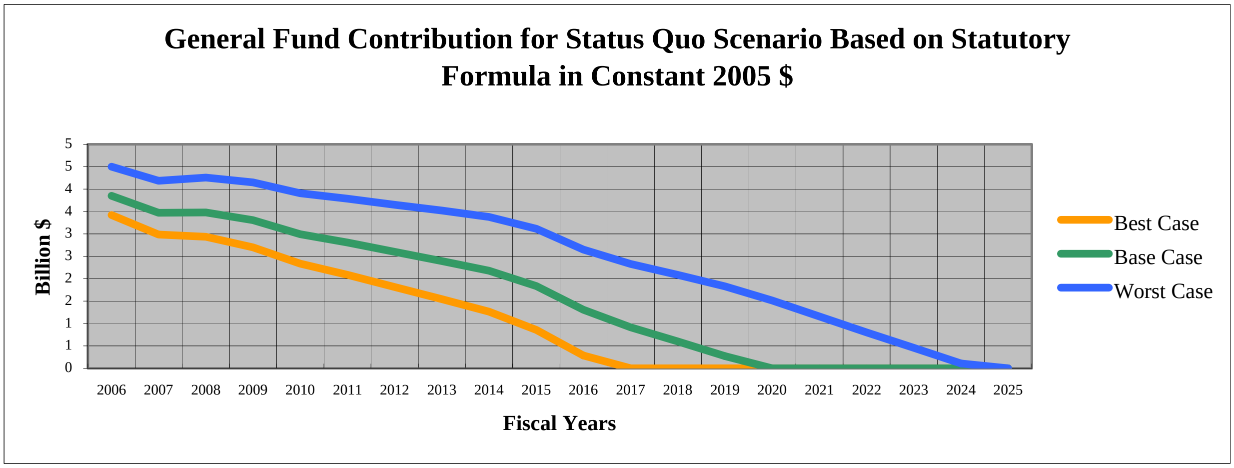


Trust Fund reserves have been used to overcome shortfalls in the past, but for the past several years the amounts appropriated from the Trust Fund have roughly equaled the FAA forecasted (shown in the Presidents Budget) amount each year. These optimistic revenue projections combined with the resulting appropriations from the Trust Fund have resulted in a significant decrease in the Trust Fund's uncommitted cash balance. If this or other reserves depleting practices continue for a few more years the reserve will be exhausted.

Trust Fund Year End Balances in Millions $	2000	2001	2002	2003	2004	2005
	7,074	7,344	4,815	3,898	2,447	1,940

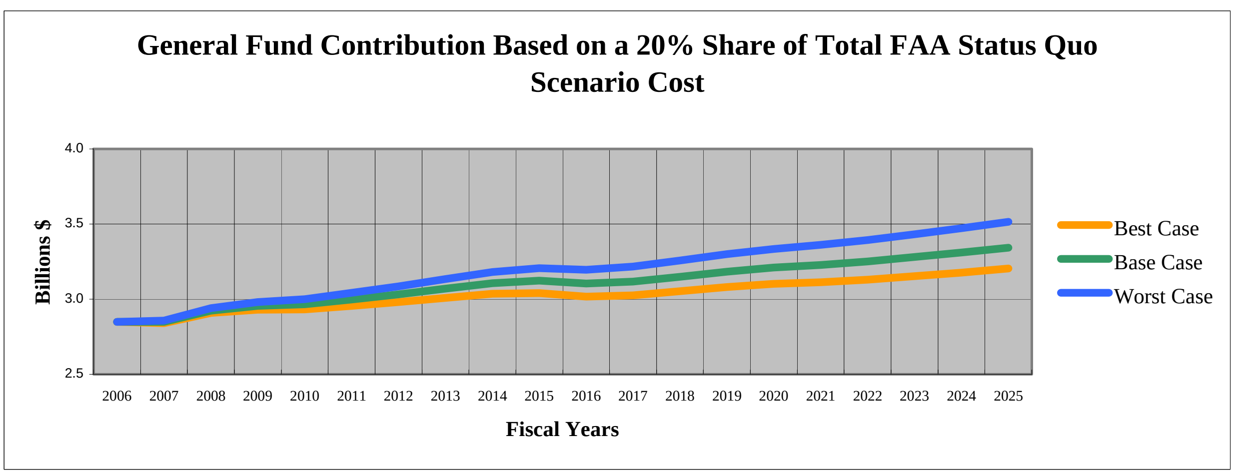
General Fund Contribution

Using the General Fund to make up the shortfall has been the norm since the beginning of the Trust Fund concept. In 2000, the Congress began using a statutory formula for determining the Trust Fund share of the FAA's Operations costs. In 2003, use of this formula was extended through 2007. For this approach to General Fund contribution to continue after 2007 it will be necessary to extend the enabling legislation. This formula requires that Trust Fund revenues first be used to fully fund the FAA's Airport Improvement Program and Facilities & Equipment Program at the authorized levels, and also fund the research and development, before being used to fund FAA operations. The formula also requires that the total amount appropriated from the Trust Fund each year must equal the amount of the tax receipts and interest forecasted to be deposited into the Trust Fund that same year. In other words, the formula requires that the forecasted Trust Fund income amount each year is the same amount that must go out that year, with preference given to fully funding the FAA's capital programs before using Trust Fund revenue to fund operations. To calculate the total amount that must be appropriated from the Trust Fund each year, the statutory formula relies upon the FAA prepared Trust Fund revenue estimates published in the President's Budget for that year. These as noted above have been overstated in most years hence the amount taken from the trust fund exceeds the income and the trust fund balance is decreasing. If this approach is continued the following General Fund contribution will result using the Status Quo Trust Fund estimates.

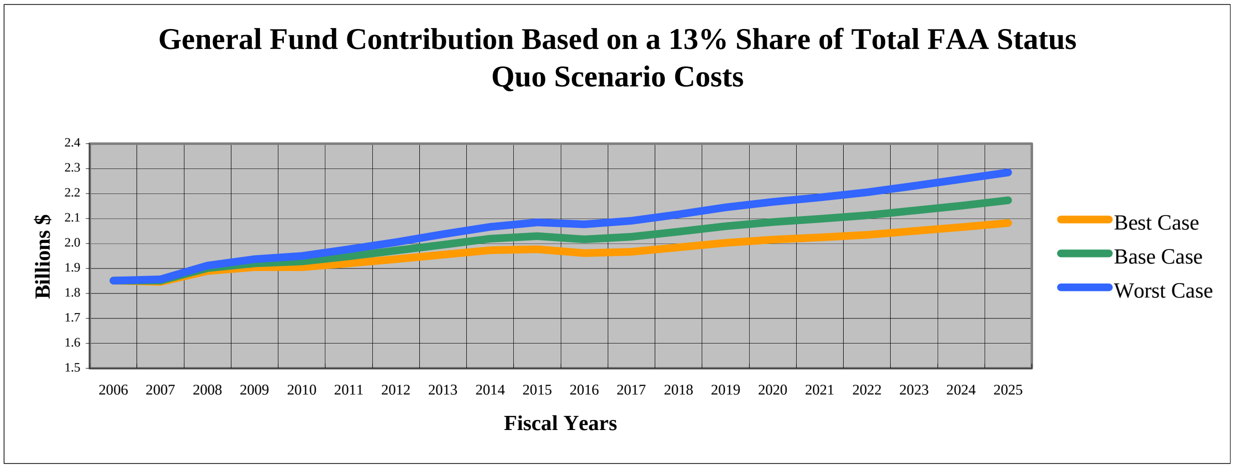


Note that the general fund contribution is high in the early years and then declines to zero as the projected Trust Fund revenue rises. In the Best Case it reaches zero in 2017, the Base Case in 2020, the Worst Case does not yet reach zero by 2024. It should be noted that out-year forecasts by their nature have greater uncertainty associated with them.

A second General Fund scenario is maintaining a constant percentage of the Total FAA Cost. In 2005 the percentage (from the Statutory Formula) was 20% and in 2006 was 18%. Proposing a constant 20% General Fund share would result in a roughly $3+ billion annual General Fund contribution:

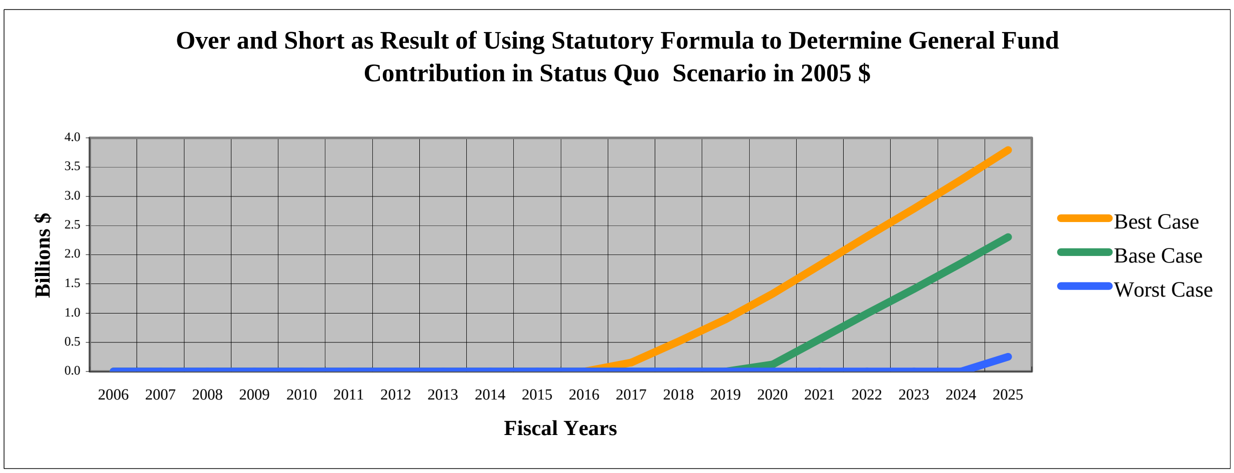


A General Fund contribution of 13% proposed by OMB for 2006 and beyond in 2006 would result in nominally a $2+ billion annual General Fund contribution:

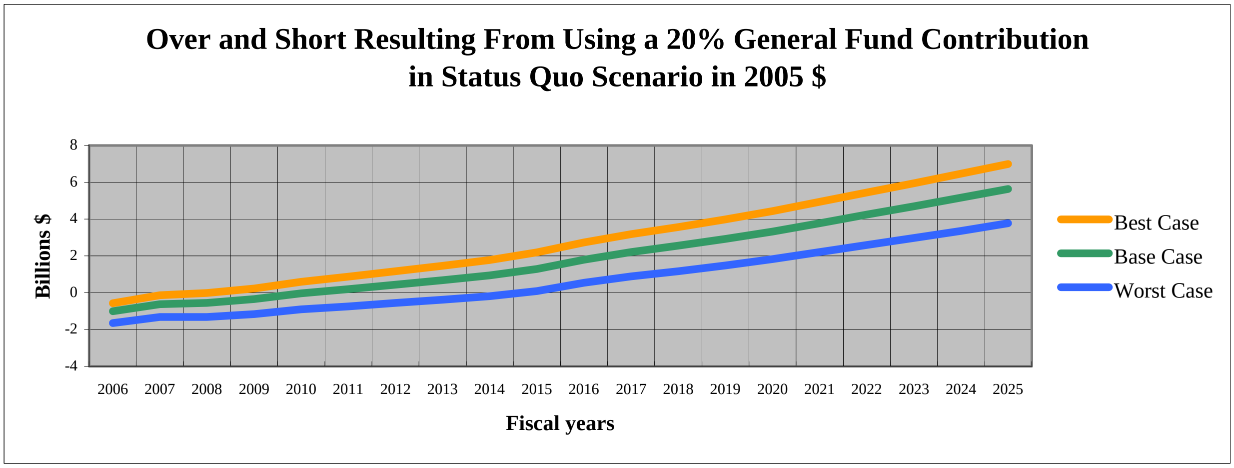


Effect of Level of General Fund Contribution on Overages & Shortfalls

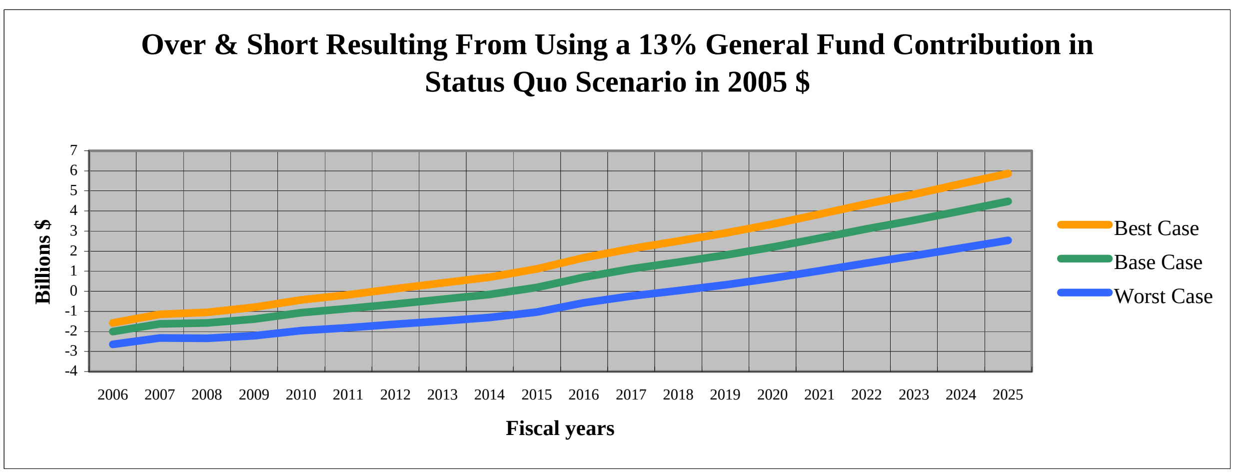
The Statutory Formula adjusts to cover the short fall in the early years. The surplus revenue in the out years leads to an overage in the Best case and the Base case in the out years.



The 20% General Fund contribution leads to a shortfall in the early years of in both the Base Case and the Worst Case. The Best Case has a small shortfall early. In all three cases there is a surplus in the out years that can lead to a build up Trust Fund reserves or reductions in user charges/taxes. Additional user fees and taxes may be necessary in early years and returned in the out years. It should be noted that out-year forecasts by their nature have greater uncertainty associated with them.



The 13% General Fund contribution alternative has significant shortfalls in the early years and leads to a small to moderate surpluses late in the out-years. It would require additional user fees/taxes in early years and provide a reduced return in far out years.



A variation on the percentage of total FAA costs that might be employed is to fund selected functions of the FAA operation, e.g. the safety regulation activities, by the General Fund. The composite cost of these activities will add up to some percentage of the total FAA costs.

At the bottom line, about 25% of the total FAA costs must be paid for out of the general fund over the next five to ten years; otherwise, a compensating amount will need to be raised in new user fees/taxes, or the costs of the FAA need to be reduced by a compensating amount. Cost reductions beyond $500 million annually appear unlikely.

OPPORTUNITIES TO SIGNIFICANTLY REDUCE COST

The FAA is pursuing substantial cost reductions in operations and other costs including the outsourcing of Flight Service operations. Additionally, the working group suggests the following as a representative list of other cost reduction opportunities:

1. Establish a date certain (such as January 1, 2008) to shut off all stand-alone non-directional beacons.
2. Reduce VOR's to about 400 by January 1, 2010; eliminate VORs by January 1, 2015;
3. Consider outsourcing more of the infrastructure operation and maintenance. Infrastructure inspection and certification should remain a government function;
4. Consolidate air traffic operating facilities after completing the proposed study on the appropriate size and distribution of these facilities.

A composite annual cost savings building to at least $500 million by FY-2010 should be the objective of the cost reduction effort.

The NGATS is expected to provide major future cost reductions by increasing the productivity of the controller work force. However, it should be noted that the primary motivation for NGATS implementation is that the current approach to air traffic control and management in use in the United States cannot be scaled up to handle the projected growth in traffic. Thus, the best model of the evolving situation is that NGATS, by using automation to transform the air traffic controller's tasks away from air traffic control toward air traffic management will allow the current staffing level to handle the increased traffic through 2025 and beyond.

The NASA aeronautics R&D program is the principal source of technologies needed to enable NGATS to provide these increases in aviation system capacity and reductions in FAA operations cost. Continued funding of this NASA program (funded from the NASA budget) is required if the Next Generation ATS is to become a reality. Moving this work to the FAA is possible but would require an additional $500 million annually for at least 10 years in research and development funds and delay NGATS implementation by at least five years as the FAA reestablishes the infrastructure needed to accomplish the work.

NGATS COST ANALYSIS

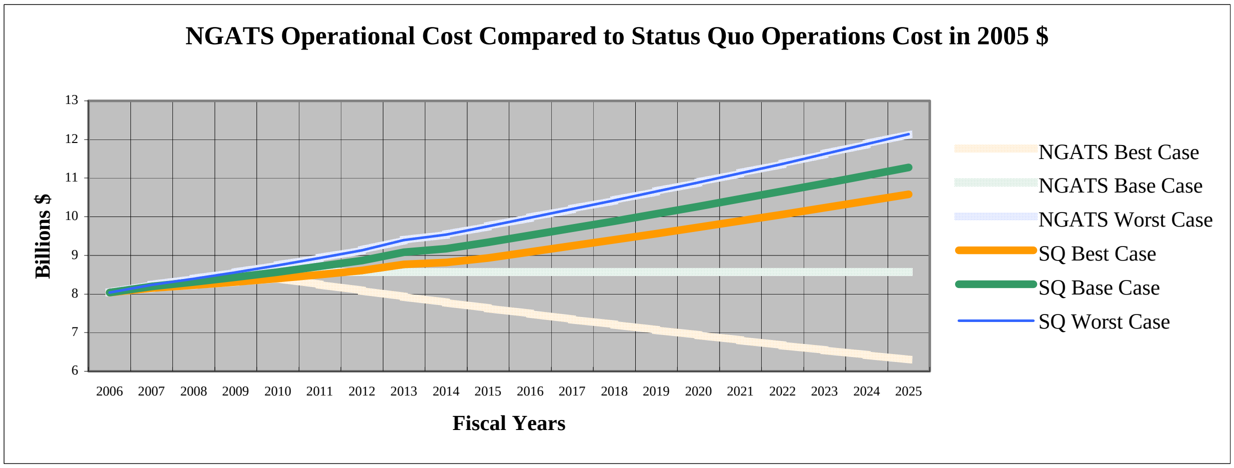
At the beginning of the working group's effort there was not a cost estimate or transition plan for implementing the JPDO National Plan. The working group worked with the JPDO, FAA ATO Planning office and the ATO Finance office to develop a transition strategy, called the Roll-Out, and subsequently a cost estimate and funding profile for the implementation of the NGATS.

NGATS Roll Out

The Roll-Out is displayed on a chart that breaks the 2006 to 2025 NGATS implementation period into four five-year periods and outlines the National Plan objectives and their incremental achievement over those five years with specific goals for system capacity, system productivity and user benefits defined for each five year period. Next a strategy for implementing these five-year goals is defined. Then a characterization of the rollout of new system capabilities that implements the goals is developed for each of the five-year periods. The research and development activities necessary to develop the capabilities are defined for each period. Then the Facilities and Equipment funded activities needed to implement the capabilities are developed and depicted. Finally, the Operations funded activities such as rule-making and operational procedures that are necessary to integrate the capabilities into the NAS to create the NGATS are defined. This process was iterated a number of times and coordinated with numerous knowledgeable people and organizations over several months. The costs of accomplishing these activities were estimated and a funding profile was developed and coordinated. The attached product of this work is attached.

NGATS Operations Cost

The Best Case scenario levels uses Status Quo Scenario results from 2006 through 2010; then reduces operations costs by 25% between 2011 and 2025 through increased productivity (about 2%/year). The Base Case uses Status Quo scenario results between FY-2006 through 2010; then assumes that increases in demand for services can be offset by productivity improvements between 2011 and 2025 to maintain cost at 2010 level in constant 2005 $, i.e. operations costs are held within inflation. In the Worst Case the cost per operation is assumed to remain constant over 2006-2025, hence costs grow as operations grows. Large reductions in operations costs are one of the major reasons for implementing NGATS. **[COMMENT—the previous sentence is talking about increasing operations cases; therefore it is confusing to say "these" large reductions]**



NGATS R&D Cost

The following is a first list of R&D activities necessary to support the NGATS development and implementation:

ATC Automation: Develop a system that automatically performs routine aircraft separation, traffic flow management, clearance generation delivery, and acknowledgement functions. Design and develop the National Airspace Optimizer including determining requirements for Optimizer integration into the NGATS system. Consider the optimum roles for pilots, controllers, and dispatchers in a highly automated system including moving certain separation responsibilities to the flight deck. Develop the optimum balance between the roles of human and machine in each domain and in association with alternative automation architectures. Develop associated human factors for the controller, pilot, and manager including responding to questions such as: How will the humans deal with the exception in an automated environment? Develop flight deck situational awareness technology.

A Seamless, Highly Fault-Tolerant System: Determine the natural capacity bounds of an automated system for enroute, transition, and terminal domains. Design the entire NGATS system for minimum safe separation in terminal, enroute, oceanic and airport surface environments. Design and develop a network centric automation system architecture and information management with the required reliability, fault-tolerant robustness and security.

Weather Impacts to Aviation: Further reduction of the effects of weather on flight safety, system and airport capacity is needed. This requires design and development of ATC and user automated decision support systems that integrate weather into the advanced automation systems. These systems would provide the ability to fully integrate a 5-dimensional weather hazard database into a full array of ATC, ATM and aircraft automation systems. A five-dimensional weather system (spatial – x, y, z, temporal t, probability P) that identifies hazardous weather for all phases of flight and for all aircraft types (air carrier, high end business jets, regional jets, baby jets, UAV, rotorcraft, small GA) including thunderstorms, in-flight icing and turbulence, oceanic and remote area weather and snowstorms is needed.

Wake Turbulence Separation Reduction Operational Enhancement: Development of wake vortex coping techniques are needed to minimize the additional wake turbulence separation beyond radar or visual separation at congested airports. This requires:

- An improved understanding of wake behavior and wake vortex encounter hazard based on statistically significant data
- Development of ground and airborne weather sensing and prediction systems that sense cross winds and wake demise, and wake location for safety alerting.
- Coupling with precision navigation including high performance RNP RNAV
- Assessment of benefits from high-update rate, low altitude, multi-lateration surveillance capability
- Airborne based relative position and deviation alerting such as ADS-B and CDTI.

Development of Separation Standards For An Automated Environment: Research to reassess current separation standards; develop methods to safely accommodate blunders, and to develop rational safe separation standards. Separation standards have been developed over the last fifty years, virtually all based on operational judgments by experts. ***They have proven to create a remarkably safe system but they limit system capacity.*** It is necessary to expand the collision risk analysis to provide a basis for future separation standards in a highly automated environment.

Development of NGATS Required Avionics: Design and develop avionics for each category of aircraft that bring the aircraft into the automated NGATS environment.

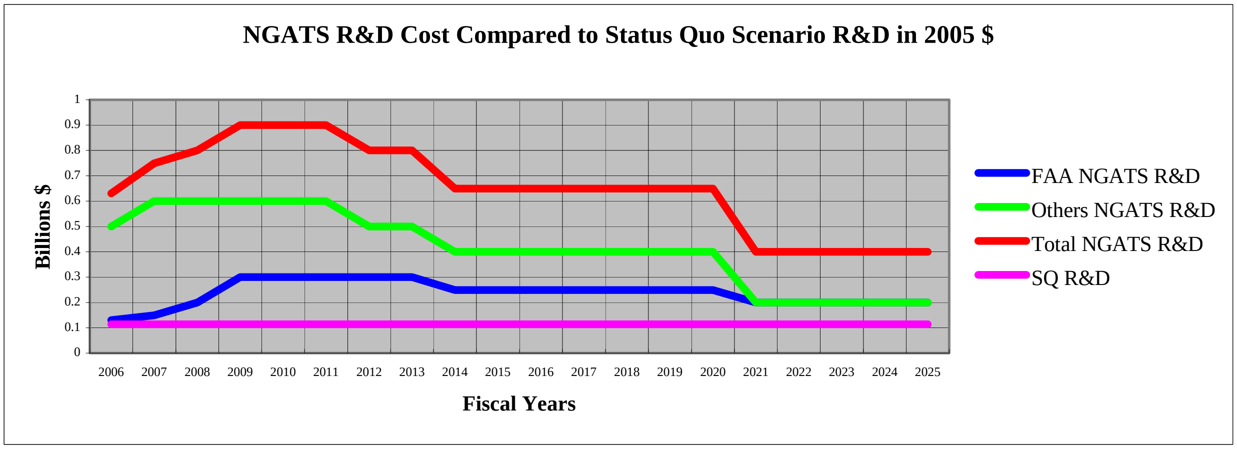
Optimum Navigation: Define optimized GNSS that provides for enroute navigation and for CAT II approaches without augmentation and CATIII approaches with augmentation.

Airports: Define and develop techniques to significantly increase airport capacity. Develop improved airport surface technologies.

NGATS R&D Cost

The following is a top-down estimate necessary to accomplish the research and development necessary to develop the NGATS. It includes FAA RE&D but not selected F&E accounts that are near R&D. Others Accounts includes the related research activities of NASA, DOD, TSA, & NOAA necessary to implement the NGATS. The coordination of these activities is critical the successful implementation of the National Plan. The technologies that enable the advertised capacity and productivity improvements are dependent on the application of this work. Note that these estimates end in 2017, which is the planned end of the NGATS development. It is also likely that R&D for the system following NGATS will be required. There is probably a similar

R&D requirement during the 2016-2025 time to support the development of yet the next generation ATS.

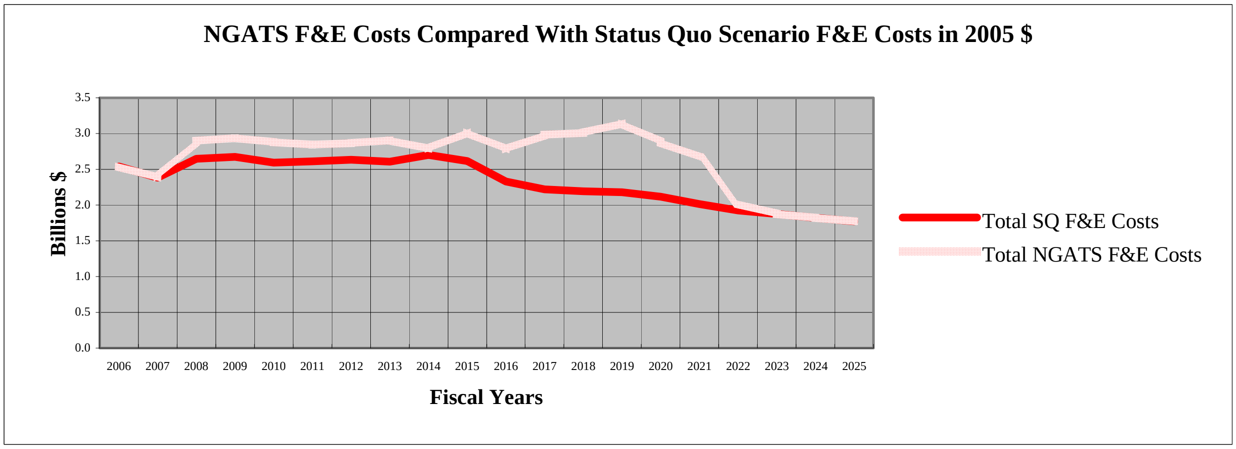


The FAA relies on the current NASA aeronautics R&D program as the principal source of the technologies needed to provide the nearer-term NGATS aviation system capacity and operations cost reductions. The current restructuring of the NASA program introduces uncertainty in this reliance. Refocusing NASA efforts on lower Technology Readiness Levels (TRL 1, 2, & 3) is a particular source of concern because it shifts a greater R&D transition burden to the FAA. To accommodate this reduction in NASA support for transition will require an additional approximately $100 million annually in FAA R&D funds. If the current NASA effort were abandoned completely, the FAA would require a further $100-150 million annually in FAA research and development funds. More importantly, NGATS implementation would be delayed, probably by five years, while the FAA reestablishes the infrastructure needed to accomplish the work. This delay in NGATS would have a severe long-term impact on the FAA operations budget.

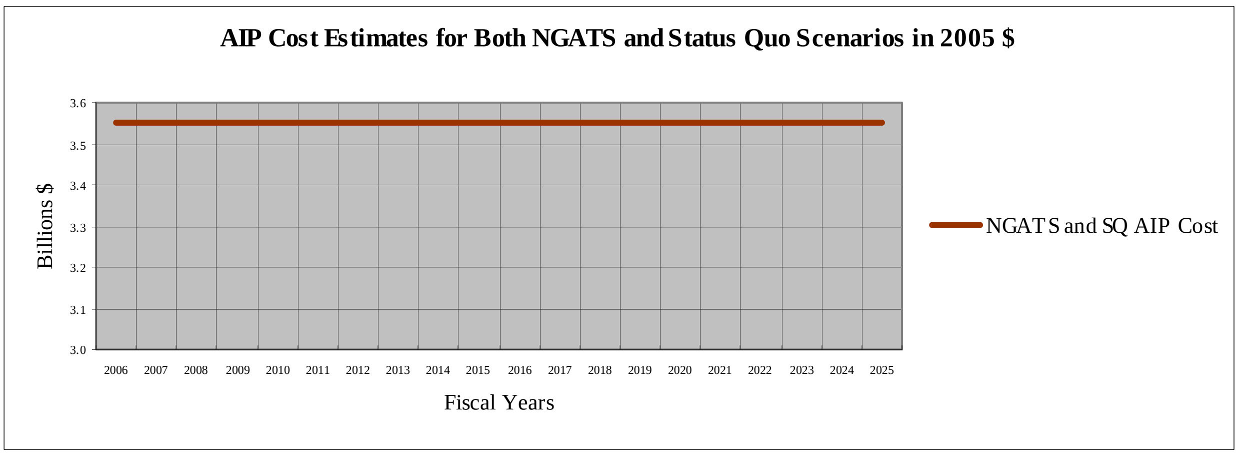
NGATS F&E Cost

The Facilities and Equipment cost estimates the funding required to support the sustainment of the NAS and the implementation of the NGATS system. These estimates have been developed and coordinated with the JPDO and the ATO Planning and Finance Offices. They represent the current best estimates for the Status Quo and the NGATS F&E projects.

Note that The NGATS implementation is projected over a twenty-year period. It begins in 2007 with technologies that are currently available such as data link and proceeds through 2025 with the implementation of newer technologies on a new network centric automation platform in a new set of facilities. The roll off in the out years may be exaggerated.

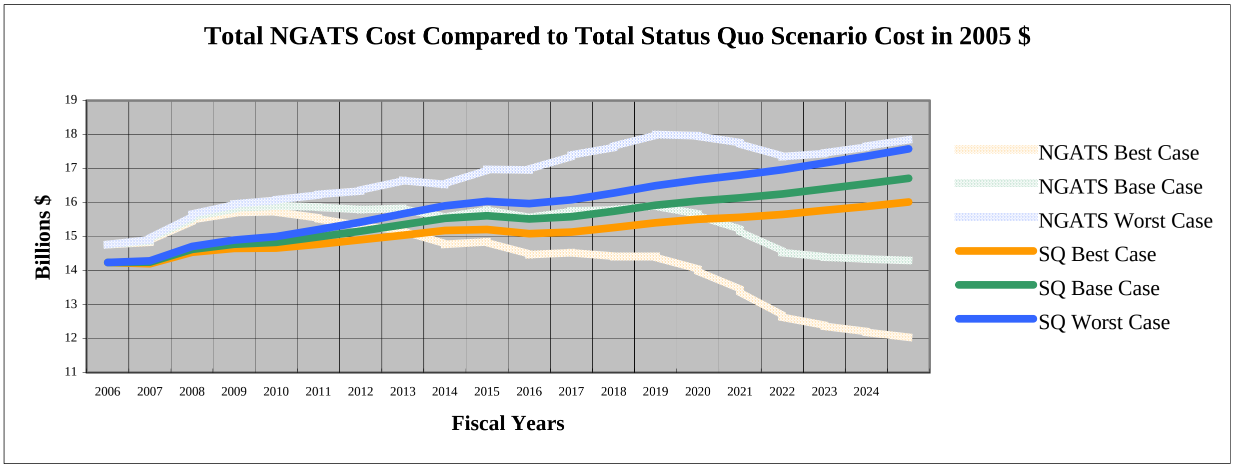


NGATS AIP Cost
Airport Improvement costs are estimated at the 2006 level throughout the period. Coordination with airport authorities is necessary to complete these estimates.

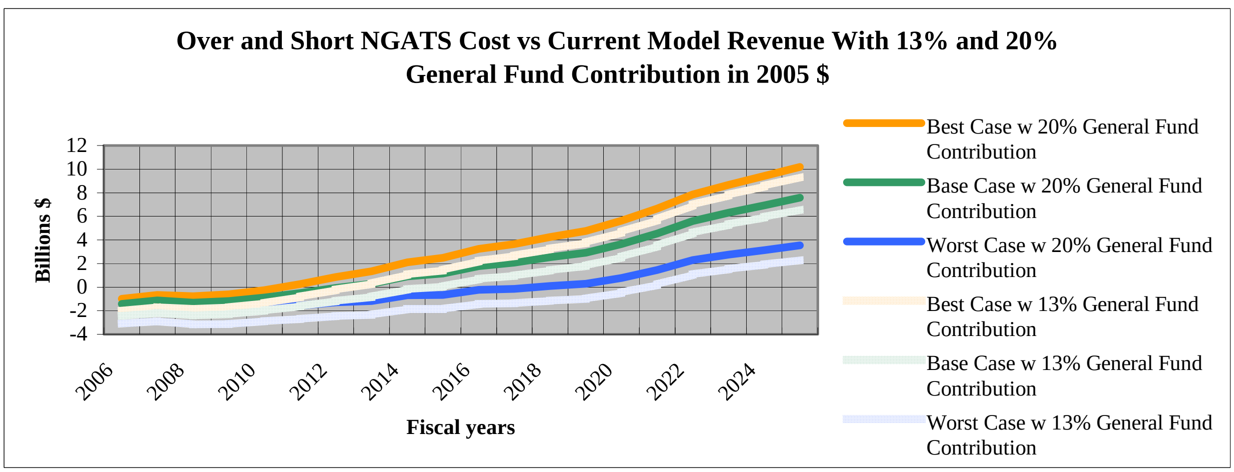


NGATS Total Cost

A comparison of the total government NGATS cost and the total government Status Quo scenario cost is shown below. Note that the total NGATS cost is expected to be slightly less than the total Status Quo cost over the twenty-year period in both the Base Case and the Best Case. Only in the Worst Case where there are no productivity benefits achieved in either the NGATS or the Status Quo scenarios is the NGATS scenario more expensive.



The over and short from comparing the NGATS costs with the current Trust Fund revenue model forecasts indicates a shortfall in the early years of $ 1 billion in the Base Case, $0.5 billion in the Best Case and $1.5 billion in the Worst Case with a 20% contribution from the General Fund. The shortfall increases to $2 billion in the Base Case, $1.5 billion in the Best Case and $2.5 in the Worst Case. If the statutory formula were used the General Fund contribution would rise to 30+% in the near term to cover the shortfall.



NGATS FUNDING

There are an infinite number of variations of four or five basic user fee/tax models with or without a General Fund contribution. The distribution of taxes or fees to user groups and the General Fund is the base problem to be solved. Each user group has a different model for determining the share of FAA costs they should pay. Once the shares are determined, the method of tax or fee collection may vary from user-group to user-group at a level to meet their allocated share. The choice of method and variations are political questions that will be addressed by the Administration and Congress with advice of aviation stakeholders.

The working group outlines four options and makes a preliminary assessment of the consequences of choosing one. None of them is expected to be acceptable by itself to the entire community. Defining and refining a hybrid of them to create an approach that is acceptable to aviation industry groups is the work of others over the next several months.

User Fee/User Tax Options

After consideration of a number of user fee and taxation options, the group reduced the set to four for further analysis. For this analysis, each option was normalized to raise $11B in fees/taxes based on estimated 2005 traffic. For purposes of this analysis $3B (~20%) of the estimated FY-06/07 required revenue of $14B is assumed to be from the General Fund in each case. Note by 2010 the required funding level is expected to reach $15B. At a 22% share the General Fund would contribute $3.3B and the user fee/tax scheme $11.7B. At a 13% share the General Fund would contribute $1.95B and the user fee/tax scheme ~$13B.

Considering the difficulty of collections and the limited amount of Trust Fund proceeds collected from light (piston) GA, this group is charged an aviation gas tax, but no other fees in all of the options. These options consider only the taxes paid into the Aviation Trust Fund. Other taxes/fees, e.g. security fees, are not considered.

Option 1 Extension of the Current Ticket Tax Scheme

The current taxing scheme with rates adjusted proportionally to generate the requisite revenue. The following rates (which are approximately 10% higher than the current rates) were derived assuming that the base on which the tax is applied is 10% higher than FY'04:

- Ticket tax 8.25%
- Segment tax $3.50
- International head tax $15.50
- Airfreight tax 6.875%
- Jet fuel tax (non-commercial operations) $0.24/gal
- Av gas tax (non-commercial operations) $0.2125/gal
- Fuel tax on commercial operations $0.0475/gal

Each element is increased over current rates. If this option were adopted, in the interest of "equity" it would be appropriate to increase the fuel tax on non-commercial operations to a larger number, in the range of $0.50 to $1 per gallon. Doing so would have relatively little impact on the overall funding situation, because the amount of additional revenue would be relatively small, but it would reduce the criticism that the non-commercial user isn't “paying his way".

Option 2 Flat Fuel Tax Option

Under this option, all domestic operations are charged a fuel tax, and no other taxes. International operations are charged an International Head Tax, at the same rate as in option 1. Based on extrapolation of FY'04 fuel usage, a fuel tax of about $0.65 per gallon (jet fuel and aviation gas) would raise the requisite revenue.

Option 3 The Weight Distance Rate Option

Under this option, all turbine operations (and probably also the relatively few commercial piston operations) would be charged a fee based on the aircraft MTOW and the distance flown. As is common in most other countries, the fee would have two components, one based on weight only for terminal-area services, and one based on weight and distance for en route services. (Typically, the en route charge is based on distance times square root of the weight.) Non-commercial piston operations (primarily light GA) would be charged a fuel tax, probably in the range of $0.50 to $1 per gallon.

Option 4 Rate Distance User Fee Option

Same as option 3 without the weight factor. All turbine aircraft, regardless of size, would be charged the same for the same operation. Also as in option 3, non-commercial piston operations (primarily light GA) would be charged a fuel tax, probably in the range of $0.50 to $1 per gallon.

Criteria for Assessing Options

The working group has developed thirteen criteria for assessing the options:

1. ***Funding Stability and Sustainability:*** Can the funding be counted on in the future? (Stability) Is there a mechanism to deal with periodic shortfalls? (Sustainability) Resilience to bad years?
2. ***Flexibility to Cost Profile Changes:*** Is the mechanism sufficiently flexible to deal with changes in cost profile?
3. ***Flexibility to Organization Changes:*** Will the funding mechanism (especially if it includes long term obligations) adapt to potential changes in government’s “status”?, e.g. NASA gets out of CNS/ATM R&D business; FAA gets corporative or does significant outsourcing of services.
4. ***Ease of Administration:*** Ease of administration of fee structure and collection of fees.
5. ***Fairness and Proportionality:*** What is impact on stakeholders? Includes questions of fairness and proportionality; to size; to operation; to revenue; etc and does mechanism work well for some stakeholders, but not others? May suggest need for a hybrid solution.
6. ***Relationship of User Benefit and Fee:*** Does the fee structure reflect benefit to those who pay, i.*e*. do people pay for what they use?

7. ***Relationship of Public Good and Fee:*** Does the fee structure reflect public good of the service? Value to nation, as opposed to individual?
8. ***Public and Private Support:*** How likely is support for proposed mechanism from public sector (Congress, Administration, State and local governments) or from private sector (airports, airlines, GA, manufacturers, passengers, shippers etc.)? Who will support it? Who will oppose it? If cost for elements like avionics falls on industry, perhaps through mandates, will they support it?
9. ***Potential Safety Impact:*** If there is a negative safety impact, the fee structure is a non-starter.
10. ***Technology Drive**:* Will it encourage technology change, e.g. more efficient aircraft; avionics that improve operational safety, efficiency, or capacity?
11. ***Equipage Drive:*** Does it encourage equipage?
12. ***Mobility Drive:*** Does it encourage mobility (use of many airports, especially the smaller markets)?
13. ***Experience of Using Option:*** Has it worked for others in aviation? Other industries? Is this experience applicable to FAA?

Initial Projection of Options Impact on User Groups

Distribution of User Fees/Taxes by User Group

User Group	Option 1 Current Tax Structure		Option 2 Flat Fuel Tax		Option 3 Weight-Distance-Based Fee		Option 4 Distance-Based-Fee	
Commercial Passenger	$10.02B	91.1%	$9.70B	88.2%	$9.53B	86.6%	$8.89B	80.8%
Commercial Cargo	$0.62B	5.6%	$0.77B	7.0%	$0.99B	9.0%	$0.61B	5.5%
Turbine GA	$0.32B	2.9%	$0.50B	4.5%	$0.45B	4.1%	$1.47B	13.4%
Piston GA	$0.04B	0.4%	$0.03B	0.3%	$0.03B	0.3%	$0.03B	0.3%
Totals	$11.00B		$11.00B		$11.00B		$11.00B	

Notes

1. Funds are constant 2005 $
2. Operations data based on extrapolation of 4/15/05 flights in ETMS
3. Fuel data based on FY04 tax collections, increased by 10% to account for the increased number of flights in FY05 vs. FY04
4. Allocation of fuel use between Commercial and Cargo based on total weight x distance of each flight
5. Allocation of fuel between GA (Turbine) and GA (Piston) based on total weight x distance of each flight
6. Tax/fee rates for each option normalized to result in same total tax collection of $11B
7. GA numbers include only those aircraft being tracked by the ETMS, and so substantially understates piston GA operations and contributions under options 3 and 4.
8. The commercial category includes all aircraft currently paying the 7.5% ticket tax. This includes airline, air taxi, charter, and fractional operators. Within the

commercial category, option 3, and even more so option 4, will result in a substantial shift in charges from large aircraft to small aircraft.

Initial Option Assessment

Funding Stability and Sustainability

Each of the options will nominally generate the defined revenue each year. However:

- Option 1 (Ticket tax based) will vary with ticket prices and with demand rise and fall.
- Option 2 (Fuel tax based) will remain stable with ticket prices but will vary with demand and aircraft efficiency.
- Option 3 (Rate-Distance-Weight) will remain stable with ticket prices but will vary with demand.
- Option 4 (Rate-Distance) will remain stable with ticket prices but vary with demand.

None of the options in themselves provide the mechanism to deal with periodic shortfalls in revenue. To overcome this problem it will be necessary to either create reserve balance in the Trust Fund or to establish a bonding capability.

The year-to-year uncertainty of the General Fund contribution is in itself a degree of instability, as is the uncertainty of the annual appropriation process. A longer-term appropriation would tend to stabilize both of these uncertainties. The concept of using a user fee approach for some or all of the FAA funding where the revenue bypasses the appropriation process would also reduce these uncertainties.

Flexibility to Cost Profile Changes

None of the options in themselves provide the mechanism to deal with changes in the cost profile. To overcome this problem it will be necessary to either establish an agency, say the FAA Air Traffic Services Committee, or for the Congress to reassess and adjust the fee levels to meet the expected cost profile. This could be done annually or on a longer term basis, say five years.

Flexibility to Organization Changes

Any one of the options should accommodate any of the publicly discussed FAA organizational variants including long-term obligations considering congressional approval of the fund use

Ease of Administration

The simplest single option to administer is probably option 2, the flat fuel tax. The user elements of option 1 are comparatively easy to administer if allocated as part of the ticketing process for air carriers or as a function of weight bills in the cargo case. They are rather complex for General aviation in any case and could be made complex in the cargo case.

Fairness and Proportionality

This is one of the most difficult questions to answer and probably can only be reduced to a political answer.

Relationship of User Benefit and Fee

Each of the primary aviation stakeholder groups has a different model for determining the proportion of the services they use and the cost they should therefore pay. While it would be interesting to compare each group's model against the models of the other groups, this question is likely to be reduced to a political answer.

Relationship of Public Good and Fee

The public good is the basis for the General Fund contribution to FAA funding. Notable areas include public access to public transportation of people and goods; the military use of the system; and payments for functions that do not generate the level of revenue that covers the cost of the capital and services provided, e.g. the smaller airports.

Public and Private Supporters

This question will be dependent upon each of the user groups' assessment of the appropriateness of the costs to be covered by the user fees and on the ultimate definition of the charging scheme and its associated distribution of the fees between the groups. Public stakeholders will consider the benefits to their interests and will often be local in view. The outcome will be reduced to a political answer.

Potential Safety Impact

None of the four options has an obvious negative safety impact. Should one of the user fee options include a fee for an optional safety-related service, it would be considered as having a negative safety impact.

Technology Drive

Option 2 (Flat Fuel Tax) may lead to a yet sharper focus on more efficient aircraft. None of the other options in themselves probably drive technology.

Equipage Drive

None of the options in themselves drives users to voluntarily equip. Equipage will occur when either it is mandatory for operation in some or all airspace or it provides for an economic benefit to the user that justifies the cost. Operational benefits or safety benefits will also have some impact on equipage. User fee discounts for equipage may have an impact but each fee discount has to be made up by an increase somewhere else.

Mobility Drive

None of the options as envisioned are likely to cause use of a greater number of airports. It may be possible to develop a version of option 3&4 that provides incentives for operation into and out of small airports.

Experience of Using Option

- Option 1 has been used in the FAA Trust Fund in one version or another for many years.
- Option 2 has been used in the current system for general aviation for many years. It is the basis of user charges for highway transportation.
- Option 3 has been used in numerous countries of the world for many years.
- Option 4 has not yet had a large usage.

NGATS IMPLEMENTATION AND FINANCING

The working group has considered the FAA NGATS implementation and funding situation and observes:

1. That the required F&E spending level for implementing NGATS is essentially flat between $2 and $3 billion in 2005 $ over a twenty year period. This amount is about $0.5 to 1 billion greater that the Status Quo scenario over the first ten years. In the out years the NGATS F&E levels are maintained at this level while the Status Quo levels decrease (See NGATS F&E Cost), though there is greater uncertainty associated with these out-year estimates.

2. That there is a $1B to $2B shortfall in total FAA funding of the NGATS scenario, depending on the General Fund contribution, for several years if today's Trust Fund mechanism is continued at the current user fee/tax level. The Trust Fund reserves will be exhausted in two to three years without a significant increase in the General Fund contribution.

3. In the longer term, the revenue levels are projected to overtake the costs levels if FAA productivity can be enhanced by NGATS technology.

NGATS Implementation Requirements

To successful implement NGATS we must recognize that:

- Operating and transforming the NAS into the NGATS is a twenty-year project and will require $300 billion, or $15 billion on average each year for twenty years, in constant 2005 dollars,
- While every effort must be made to devise a funding strategy to minimize year-to-year variants in user fees/taxes and operations and implementation expenses, some will occur,
- A program process must be deployed that ensures successful and cost effective development and implementation of NGATS capabilities,
- A consistent and stable management and oversight mechanism is essential to safely operating the NAS while transforming it into the NGATS, and
- A mechanism of measuring ongoing costs, performance and progress toward transformation of NAS to NGATS is necessary.

The Six Engines for Success

The working group proposes a toolbox of the **Six Engines for Success** to address these requirements:

1. The first element of success is the **Leader**. Given that the NGATS implementation is a twenty-year program this really means a minimum of three and likely five leaders to accomplish the NGATS implementation. The selection and development

of these people is probably the most important element to NGATS success. In addition to being smart and hard working people they must know the NAS and the NGATS and the transformation between them. They must be innately people of vision and public purpose. Recognizing the need for a Leader and a Leader Elect to maintain continuity over the twenty-year period is very important.

2. A **Revenue Engine** that raises the required $15 billion each year through a collection of user fees/taxes and contribution from the General Fund. It is assumed that this engine is a variant of one or more of the funding approaches discussed above.

3. A **Financial Stability Engine** that accommodates year-to-year variations in the revenue or expenses. In the past this engine took the form of annual adjustments in the General Fund contribution or in some form of cost cutting that changed the outcome of the program. Successful implementation of the NGATS requires access to some sort of reserve fund to cover these variations.

   A Financial Stability Engine approach might be an expansion of the current Trust Fund concept where the money collected from fees and taxes would go into the Trust Fund and all FAA expenses except those for a selected set of regulatory safety activities would come out of the Trust Fund. These regulatory safety activities would be supported by a General Fund contribution. A target year-end Trust Fund reserve balance range would be established by legislation. If the year-end balance is too low, taxes and/or fees are raised for the following year according to a legislated formula. This adjustment process would have congressional oversight, but would not require legislation. If the year-end balance is too high, taxes and/or fees will be lowered according to the same process. If the year-end balance is in range, no change will be made in the taxes and fees for the ensuing year.

   A second Financial Stability Engine alternative could be establishment of two funding FAA streams: the first a continuation of the user fee/taxed based appropriation for operation of the FAA and funding AIP and the second a special purpose user fee that goes directly to the FAA for the purpose of supporting R&D and F&E activities. Associated with this user fee would be an authority to issue revenue bonds to fund some or all of the R&D and F&E activities. The special purpose fee would be used to cover repayment of the bonds. This approach would mean that future users of the system would thus pay, be it a higher cost, for the facilities and equipment they are using.

   The selected Financial Stability Engine could be any one of an infinite set of variations but will always be some combination of either reserve accounts or borrowing authority.

4. A **Program Engine** that provides the mechanism for developing, producing, implementing, and commissioning on line the various capabilities that transform the NAS into the NGATS over these next twenty years. Approaches that focus government staff on identifying service requirements and assuring that services are

properly provided rather than designing, developing, producing, implementing and operating NGATS equipments, may lead to earlier implementation with earlier benefits at lower cost and risk while reducing the initial cash outlay.

A ***Service Purchasing*** approach is an example that could provide for vendor financing of the assets and reduced overall costs to the government. An example may be the purchasing of Air-to-Ground communications including the air-to-ground ADS-B function as services through a competitive procurement. In this example the vendor would provide international standard digital voice, and data link services in the entire U.S. sovereign and delegated airspace from near the surface to upper altitudes. This capability would provide the basis for implementing much of the NGATS productivity and capacity increases while interfacing with all equipped aviation users. The approach would supersede the Data Link, Digital Radio, CPDLC (Controller-Pilot Data Link Capability), and ADS-B (Automatic Dependent Surveillance-Broadcast) programs.

The **Program Engine** must see the NGATS implementation as a twenty-year program that requires a consistent and stable program management approach to implement NGATS capabilities promptly and efficiently.

5. A **Planning, Management, And Oversight Engine** that provides the mechanism for maintaining the NGATS implementation plan, managing its accomplishment, providing for its oversight by the FAA, the aviation community, the Congress and the Administration.

   A twenty-year plan in four five-year increments similar to the NGATS Roll-Out used by the working Group might be a basis for this engine. The idea would begin with a specific set of incremental safety, capacity, FAA productivity, and user benefits objectives for each of the five-year segments; followed by a strategy for achieving the goals; followed by a rollout of NGATS capabilities in increments in each of the five-year segments. Then the R&D, F&E, and Operations activities required to implement the capabilities would be ordered into the five-year segments. The expected costs for these activities would be estimated for each five-year segment. We now have the basis for an agreement between the FAA, the aviation industry, and the Congress on what needs to be done, when and how it will be done, how much it will cost, and the benefits to be achieved by its accomplishment. Propose that the first five-year segment serve as the basis for both a five-year authorization and a five-year appropriation tied to a five-year agreement on the user fees/taxes, levels of funding and the performance objectives for the FAA. In year three or four performance against the goals of the first five-year segment would be reviewed; negotiation to reduce the second five-year segment to an agreement would proceed; the twenty year plan would be extended for an additional five year period; and the twenty year plan revised as needed to meet the current aviation needs. The result would be a constant view of the next twenty years in five-year segments. In this context the FAA would propose the twenty-year plan, the industry would review, the

Congress would authorize and appropriate, and the Administration approve the plan in five-year segments.

In any case a Planning, Management and Oversight Engine is required that provides for the management of NGATS as a twenty year program is required recognizing that it will be overseen by several different Congresses and Administrations during its accomplishment. Each will want to leave their mark on the product. This engine may include some sort of Congressional hearing and review process to assess performance.

6. A **Metrics Engine** that facilitates the measurement of the on-going performance of the NAS and the progress toward its transformation to the NGATS. Is organized as a twenty-year view to support the transparent measurement of specific metrics at a time and the incremental change in that metric over time. Enables measurement of the accomplishment of the objectives of each five-year plan segment by each member of the aviation community and the Congress. Includes measurements of Safety, Capacity, Environmental Impact, FAA Costs, FAA Productivity, and User Benefits as a minimum.

NGATS Financing Through Private Sources

Financing can be used to stabilize the funding stream as noted above, it spread the cost of the project to be better aligned with the benefits of the project, provide greater control over timing of capital investments, avoid "intergenerational" funding problems, and provide for more businesslike management of management of the NGATS implementation.

The working group has reviewed the government budget process and the constraints on private financing. The result is the discussion below that acknowledges the possibility but difficulty of arranging private financing.

FAA Funding – Appropriations and Taxes:

FAA's budget is divided into four accounts – Operations, Facilities and Equipment (F&E), Airport Improvement Program (AIP), and Research, Engineering, and Development (RED). The capital accounts (F&E, AIP and RED) are funded 100% with monies from the Airport and Airway Trust Fund. The Operations account is funded with both General Fund monies and funds from the Trust Fund. The fact that FAA receives most of its funds from a Trust Fund has almost no bearing on FAA's budget treatment. While two of FAA's accounts are funded with contract authority, all four of these accounts typically receive their funds through the annual appropriations process.

Budget Rules – Mandatory and Discretionary Funding

To properly discuss aviation funding issues, such as replacing existing taxes with user fees, or using existing taxes to support bonding authority, a basic understanding of federal funding rules is necessary.

One basic funding rule is that the Federal spending and revenue streams are divided into two categories -- Mandatory and Discretionary. Mandatory spending is also referred to as direct spending or entitlements. Mandatory spending includes Medicare, Veterans' benefits, and Social Security. Mandatory refers to spending or revenue actions that are taken by the authorization committees. In the world of aviation, our authorization committees include the House Transportation and Infrastructure Committee, the House Science Committee, and the Senate Commerce, Science and Transportation Committee. Aviation taxes are mandatory as well, and are in the jurisdiction of the House Ways and Means Committee or the Senate Finance Committee. These committees typically pass multi-year mandatory spending or revenue legislation.

Discretionary funding is controlled by the Budget Committee and the Appropriations Committee. The House and Senate Budget Committees annually set the overall discretionary spending constraints and the Appropriations Committee develops the specific discretionary spending bills, which are annual spending bills.

The fact that the aviation revenues are mandatory and FAA spending is discretionary usually is not an issue. However, when aviation policy discussions begin to explore using existing taxes for new purposes, an understanding of budget scoring is essential.

Budget Scoring – Controlling Revenues and Controlling Spending

Prior to 1921, there were no central controls on federal spending. Congressional Committees were not given spending guidelines and this decentralized budging process led to large federal deficits. The Budget and Accounting Act of 1921 created the Bureau of the Budget (now the Office of Management and Budget), established the General Accounting Office, and required the President to submit an annual budget to Congress. This was the first time the Federal budget was considered in its entirety.

Over the years, Congress and the Executive Branch have amended the Budget and Accounting Act and have adopted additional rules to control Federal revenues and spending. Some of these rules are in law, some in resolutions, and others in Executive circulars. These rules encourage that the budget is reviewed as a whole, national priorities are set, and the American taxpayers are protected from increasing deficits and taxes. Their success has been mixed.

To describe these budget controls in the most general terms, at the beginning of every calendar year, Congress and the Executive Branch estimate what the tax revenue will be for the next fiscal year and what mandatory spending requirements the government is facing. Then, there is a decision on what the total discretionary spending will be, taking into account whether or not the government is willing to borrow funds. Once that overall spending goal is set, there are rules to ensure that no laws are passed which would reduce the anticipated tax revenues or increase the spending levels above the anticipated levels. If a bill or government action is proposed that would decrease revenues or increase spending outside these agreed upon levels, it is considered a "scoring problem" unless the bill provides a budget cut or an increase in revenues in another part of the budget.

One way to avoid a scoring problem is to provide an offset – in other words, if a bill would include a tax cut, then the bill could also provide a spending cut of equal value as an offset. The only catch is that if the tax is on the mandatory side of the budget, the offset in spending must also be on the mandatory side of the budget. The Federal budget is in two categories; mandatory and discretionary – so a reduction in mandatory revenues cannot be offset by discretionary spending cuts. This is because mandatory taxes are multi-year and discretionary spending is one year – so a multi-year reduction in taxes must be off-set with a multi-year reduction in spending, or replaced with other multi-year revenues.

A simple example of a bill with a scoring problem would be a bill stopping any tax – for instance, a bill discontinuing the aviation segment fee. A bill that discontinues the segment fee would be "scored" by the Congressional Budget Office at a dollar amount equal to the estimated revenue those taxes would have generated. This tax cut bill could only pass if there was a decrease in mandatory spending or if the point of order against the bill was overridden with a 2/3 vote.

There are some exceptions, one being emergency supplemental funding which is not required to have an offset, however, Congress and the Executive Branch often attempt to offset some or all of many emergency spending bills.

Using FAA's Current Taxes for New Purposes and The Budget Rules

There have been some discussions in the aviation community of using some or all of the current aviation taxes for new purposes. There are budget-scoring implications to those proposals. For instance, to use the segment fee to support a bond would create a scoring problem. The current aviation taxes are part of the mandatory budget and are expected to be collected for the foreseeable future. Therefore, a bill that discontinues the segment fee (even though it is expiring) would have a scoring problem (equal to the amount expected to be collected by the segment tax). In addition, a bill that diverted the segment fee for a new purpose (such as serving as a payment stream for a bond) would also be scored equal to the expected loss in tax revenue. Since the revenue is on the mandatory side of the budget, a reduction in FAA spending would not be an acceptable off-set, since FAA spending is discretionary.

A new tax, however, could be used as a revenue stream to support a federal bond, or another approach to funding FAA investments. However, bonds also have unique scoring issues.

Bonding in the Federal Government

There have been several aviation policy discussions about using bonding to support aviation capital investments. However, implementing bonds to support federal agencies' capital investments are often not successful, in part, because Treasury views the ultimate cost of bonding to be more expensive then annual appropriations.

Most of the federal budget policy makers believe that the best way to fund federal capital projects is through the annual appropriations process. The OMB Circular A-11 that establishes the guidelines for developing the President's annual budget request to Congress, states:

300.6 How are capital asset acquisitions funded?

(a) Background.

Good budgeting requires that appropriations for the full costs of asset acquisition be enacted in advance to help ensure that all costs and benefits are fully taken into account when decisions are made about providing resources. For most spending on acquisitions, this rule is followed throughout the Government. When capital assets are funded in increments, without certainty if or when future funding will be available, it can and occasionally does result in poor planning, acquisition of assets not fully justified, higher acquisition costs, project (investment) delays, cancellation of major investments, the loss of sunk costs, or inadequate funding to maintain and operate the assets.

(b) Full funding policy.

The full funding policy (see section 31.4) requires that each useful segment (or module) of a capital investment be fully funded with either regular annual appropriations or advance appropriations. For definitions of these terms, see section 300.4 or the Glossary of Appendix J. Appendix J elaborates on the full funding concept (see Appendix J section C, Principles of Financing).

The general belief is that special bonding authority for an agency is not cost effective. Treasury Secretary Snow wrote a letter in 2003 strongly opposing a bill to allow special bonding authority for transit projects. He stated that "I want to emphasize that these strong objections exist whether the proceeds of these bonds are used to finance mass transit, highways, or any other form of federal spending. If legislation including these or similar proposals were to be presented to the President, I would recommend that he veto the legislation."

Under all recent administrations, Treasury has been on record opposing special bonding authority. Treasury's concerns include the fact that Treasury bonds are the least expensive way to borrow funds due to the volume they generate; therefore, any special bond would be more costly for the tax payers. In addition, once a precedent is set that other agencies can issue Federal bonds, Treasury's lower bonding rate will be threatened. In general, it is better for the tax payers that one entity provides borrowing services in order to receive the benefits which come with large volume bonding authority.

Even in cases where special bonding authority has been considered, the scoring rules have discouraged final action. In most cases, the Congressional Budget Office (CBO) will require that the full amount of the bond be scored in the first year instead of the annual bond payments. This scoring position is in part to discourage more costly bonding outside of Treasury, but also, because CBO believes spending is spending and should be shown on the federal books in the year it is spent.

At first glance, this scoring policy may appear to be "unfair", however, the budget accounting principals are pretty simple – revenues minus spending equal deficit (or surplus). If the CBO rule allowed only the bond payment to be scored (as opposed to the full bond amount), then every year, in the big federal budget picture, we would not run a deficit. The calculation would be revenues minus spending plus bonding equals zero. In recent times, the Federal Government has issued bonds to cover the gap between spending and revenues, but that spending is scored in the year it appropriated; otherwise, the federal books would not show any deficit.

Government Leasing – operating versus capital

Another "creative financing" option discussed has been issuing an operating lease. There are three types of leases defined by the Office of Management and Budget (OMB): Lease-purchase; Capital Lease; and Operating Lease. The scoring of these three types of leases simply means "What would need to be appropriated for the Executive Branch to sign a contract."

OMB and the Congressional Budget Office (CBO) believe that the most efficient way for the government to invest in capital is with annual appropriated funds (any other scenario would require interest payments, making the purchase more costly). Therefore, any capital lease agreement, which would include any, identified or buried interest payments would be discouraged. The way OMB and CBO discourages any capital lease agreement is to require essentially the full cost of the contract to be paid in the first year. This approach means that a capital lease "scores" in year one at the full cost of the contract – removing all incentive to enter into a capital lease contract.

Definitions:

The definitions of the three types of leases are included in OMB A-11 and interdependent:

<u>Lease-Purchase</u>: any lease in which ownership of the asset is transferred to the Government at or shortly after the end of the lease term (may include a bargain-price option).

<u>Capital Lease</u>: any lease other than a lease-purchase that does not meet the criteria of an operating lease.

<u>Operating Lease</u>: any lease that meets ALL of the following criteria:

1) Ownership of the asset remains with the lessor during the term of the lease and is not transferred to the Government at or shortly after the end of the lease term.
2) Lease does not contain a bargain-price purchase option.
3) Lease term does not exceed 75% of the estimated economic life of the asset.
4) Present value of the minimum lease payments over the life of the lease does not exceed 90% of the fair market value of the asset at the beginning of the lease term.
5) Asset is a general purpose asset rather than being for a special purpose of the Government and is not built to the unique specification of the Government as a lessee.
6) There is a private sector market for the asset.

A true Operating Lease is scored equal to the annual payments of the contract plus cancellation costs.

Creative Financing – An Overall Look

The summary of budget rules, scoring issues, and policies of the Federal Government may seem that any kind of "creative financing" is unattainable. However, there are several success stories, even in the world of transportation. Those success stories have developed because of strong policy needs. Creative financing cannot be debated in a vacuum – if it is, then it is sure to fail. Creative financing can only succeed if a clear investment need is articulated with a federal policy crisis. The first step is NOT to identify a creative way to finance -- the first step is to identify the problem and the specific need and then identify a unique financing mechanism. As we all know, there are lots of worthy causes in the Federal Government that could claim special budget treatment is needed. The biggest threat to the makers of budget policy is setting a precedent. Therefore, it is a solid policy need that must be established to support special budget treatment.

Borrowing from the Federal Financing Bank

It may be easier to borrow from the Federal Financing Bank, as Postal Service, Bonneville Power, and others do. This approach requires further investigation.

APPENDIX A: Terms Of Reference

1) **Objective**. Investigate options for financing Next Generation ATS currently outlined by the National Plan and currently being further defined by Joint Planning and Development Office of the FAA, TSA, and NOAA, their parent departments, NASA, DoD, and OSTP.

2) **Scope.** Investigate the available options for funding and financing research and development, capital projects, and operations cost of the Next Generation ATS. The effort will address: participating agency research and development programs from FY-2007 through 2016; capital, operations, and aid to airports programs from FY2010 and through 2025. The working group will consider the levels of funding required, possible revenue sources, and techniques for financing capital expenditures. It will consider cost reduction options, as well as, leasing, purchasing services, and other options for providing the infrastructure of the Next Generation ATS. The Working group will not consider privatizing the FAA or industrial issues such as labor management relations, employee salaries, etc.

3) Candidate Work Group

1) Mr. Gerald Thompson
2) Mr. John Fielding, Raytheon, Retired
3) Dr Aaron Gellman, Northwestern University
4) Dr Jack Fearnsides, Independent Consultant
5) Mr. Paul Drouilhet, MIT LL retired
6) Gen. Jack Cole, ATA
7) Mr. Neil Planzer, Boeing
8) Ms. Carol Carmody, formerly with NTSB
9) Mr. Ron Swanda, GAMA
10) Mr. Michael Lexton, Bear Sterns
11) Mr. Ed Montgomery, ARINC
12) Mr. Andy Cebula, AOPA

4) Supporting Government Personnel

1) Ms. Joan Bauerlein, ATO-P Designated Federal Official
2) Mr. Bob Robeson, APO-200
3) Ms. Gloria Dunderman, ATO-P
4) Dr Andres Zellweger, Embry Riddle/NASA/JPDO
5) Mr. John Kern, JPDO

5) **General Work Plan and Schedule**

1) *April*, Collect and review related studies and actions taken by other government agencies and other countries.
2) *April-May*, Solicit ideas from industry, government, company groups and individuals.
3) *April and Continuing*, Develop and refine the level of funding required to support the Next Generation ATS through 2025.
4) *May*, Develop a preliminary set of funding, cost control, and financing alternatives.
5) *May-June*, Interview selected members of the business and financial communities to discuss alternative financing ideas.
6) *May-June*, Develop criteria for assessing financing alternatives.
7) *June*, Review of preliminary work with FAA staff
8) *June-July*, Develop the working groups proposed set of alternative funding scenarios.
9) *August*, Prepare preliminary report of findings
10) *September*, REDAC review
11) *September*, Stakeholders review
12) *September*, Review of findings with FAA staff
13) *December*, Prepare final report of findings

NAS to NGATS Roll Out			
Base Period 2006 thru 2010	**Initial NGATS 2011 thru 2015**	**NGATS 2016 thru 2020**	**Final NGATS 2021 thru 2025**
OBJECTIVES			
Capacity +25% Productivity + 5% Delays -10%	Capacity +35% Productivity +35% Delays -15%	Capacity +35% Productivity +35% Delays -15%	Capacity +35% Productivity +35% Delays -10%
STRATEGY			
1. Implement ongoing programs that increase capacity and productivity and reduce delays on the NAS/STARS/ARTS Platform. 2. Define overall NGATS and initiate the development of 1st Generation NGATS. 3. Search for opportunities to reduce cost and implement them.	1. Implement 1st Generation NGATS on ERAM/STARS/ARTS/Transition CNS platform to enable initial productivity and capacity increases. 2. Development of the 2nd Generation NGATS. 3. Realign airspace and procedures and consolidate facilities to capture benefits.	1. Implement the 2nd generation NGATS on the "Network Centered" Platform to enable a significant increase in capacity and productivity. 2. Development of the 3rd Generation NGATS system. 3. Consolidate facilities and realign airspace and procedures to capture benefits.	1. Implement the 3rd generation NGATS to achieve the advertised productivity and capacity increases. 2. Begin work on Next-Next Generation ATS 3. Realign airspace and procedures and complete facility consolidation to capture benefits
CAPABILITY 1 NETWORK ENABLED INFORMATION ACCESS			
A. Ground-to-Ground			
(1) Interagency info sharing enhances national security (2) Integrated surveillance network enhances national defense & reduces costs (3) FAA and AOC inform sharing reduces user costs (4) FAA and FBOs share collaborative decision making info improves sys access	(5) Automated handoff info sharing increases capacity & productivity (6) Automated FAA\AOC auto-negotiation increases efficiency & productivity		
B. Air-to-Ground			
(1) A transition CNS capability w ADS-B enables air-to-grd information sharing & surveillance redesign.		(2) Airborne Information Web enables grd-to-air information sharing that reduces FAA & User costs.	(3) Airborne Info Web enables air-to-grd info sharing that safety, security & efficiency
C. Air-to-Air			
		(1) Airborne Info Web enables info sharing between aircraft increasing safety, security, and efficiency.	(2) Airborne Info Web enables aircraft to aircraft info sharing increasing safety, security, and efficiency.
CAPABILITY 2. PERFORMANCE BASED SERVICES			
A. Communications			
(1) Data link rule making (2) Initial controller-pilot data link capability reduces FAA and user costs	(3) Data link clearance delivery reduces FAA and user cost. (4) 4-D trajectory data link delivery improves FAA productivity	(5) 4-D trajectory negotiation by data link reduces user costs.	
B. Navigation			
(1) SatNav rule making (2) RNP routes established to and from all congested airports to increase capacity.	(3) RNP routes established to and from all runway ends at congested airports to increase capacity.	(4) Time-metered RNP routes flown to all runway ends at congested airports to increase capacity.	(5) RNP routes to all airports serving commercial traffic.
C. Surveillance			

NAS to NGATS Roll Out			
Base Period 2006 thru 2010	**Initial NGATS 2011 thru 2015**	**NGATS 2016 thru 2020**	**Final NGATS 2021 thru 2025**
(1) ADS-B rule making (2) CDTI rule making (3) Integrated surveillance network reduces infrastructure costs and enhances safety and security. (4) Air-to-air surveillance enables reduced oceanic separation & increased capacity.	(5) Position and intent information shared between aircraft via ADS-B enhances safety (6) Aircraft sharing ADS-B position and intent with major terminals increases safety and security	(7) Aircraft sharing position and intent information with en route ATC via ADS-B increases safety and security. (8) Aircraft sharing ADS-B position and intent with ATC in all airspace increases safety and security.	
D. Environment			
	(1) Use of 4-D flight paths reduces noise and emissions impact	(2) Advanced engines reduce noise and emissions.	
E. Safety			
(1) Proactive risk-based safety management system (SMS) enhances system safety (2) Safety analysis provides mathematical basis for redefined NGATS separation standards for en route, terminal, runway spacing, et.al	(3) Safety data collection and analysis resulting in safety improvement.		
F. Service Level Implementation			
(1) Service levels based on user equipage and training capabilities increase capacity.	(2) RNP approaches /departures required at congested airports to increase capacity. (3) Improve airspace utilization to provide temporal flexibility and improved responsiveness	(4) Negotiated contracts between users and service providers increase capacity.	
CAPABILITY 3. ADVANCED AIR TRAFFIC CONTROL AUTOMATION SERVICES			
A. Future Role of Pilot, Controller, Dispatcher, and Others			
(1) Alternate scenarios are defined based on RTCA ops concept with safety and cost benefit analysis.	(2) Scenario is selected and adjustments made in NGATS programs to accommodate	(3) NGATS Pilot (including avionics), controller, dispatcher, and other workstations enable selection.	
B. Decision Support Tools			
(1) Complete implementation of TMA increases capacity and productivity. (2) Complete implementation of URET increases capacity and productivity			
C. Traffic Flow Management			
(1) Implementation of TFM modernization package reduces delays and increases capacity			
D. Separation and Sequencing			
(1) Automation of routine separation and sequencing are developed from NASA baseline	(2) Implementation of automated separation and sequencing in en route and terminal airspace increases capacity and productivity.	(3) Integrated package of advanced separation & sequencing, airspace management, and trajectory management techniques increase capacity and productivity	(4) Follow on package of advanced separation& sequencing, airspace management, and trajectory management techniques further increases capacity and productivity
E. Platforms, Network & Protocols			
PLATFORM #1. NAS/STARS/ ARTS platform in place with FTI grd\grd network.	PLATFORM #2. ERAM platform with ERAM work stations, Transition CNS and FTI grd/grd network	PLATFORM #3. NEO platform with NEO work stations, Airborne Info Web and NGATS grd/grd network	
(1) NEO design principles including fault tolerance, reliability, integrity suitable to support a highly automated air transportation system are defined.	(2) NEO, Airborne Info Web & grd\grd network design & development	(3) Transition from Platform #2 to Platform #3 2016-2020 Fully Platform #3 by 2020	

NAS to NGATS Roll Out			
Base Period 2006 thru 2010	**Initial NGATS 2011 thru 2015**	**NGATS 2016 thru 2020**	**Final NGATS 2021 thru 2025**
CAPABILITY 4. AIRCRAFT TRAJECTORY-BASED OPERATIONS.			
A. Airspace Reconfiguration			
	(1) Special use Airspace & Temporary Flight Restrictions are dynamically managed to enhance access, reduce delays and prioritize security needs. (2) Enroute facility airspace is dynamically configured by demand/capacity balancing to reduce delays, increase efficiency, accommodate disruptions and potentially reduce facilities	(3) Terminal facility airspace is dynamically configured by demand/capacity balancing to reduce delays, increase efficiency, accommodate disruptions and potentially reduce facilities	
B. 4-D Trajectory Development			
	(1) Implement time based metering nationwide to increase capacity (2) Enroute 4-D trajectory management is the basis for reduced delay and increased capacity.	(3) Terminal 4-D trajectory management is the basis for reduced delay and increased capacity. (4) Surface 4-D trajectory mgmt based flight planning reduces surface delay and airport congestion.	
CAPABILITY 5. WEATHER ASSIMILATION INTO DECISION LOOPS			
A. Observations			
	(1) Enhanced sensor development and deployment to enhance capacity and increase safety.		
B. Forecasts			
	(1) Fusing sensors and models into a national database improves forecasts & reduces Wx delays		
C. Database			
	(1) Sharing of improved weather information with users enhances flight planning & reduces Wx delays		
D. Probabilistic Development			
		(1) Inclusion of probabilistic and deterministic weather info into decision making process reduces Wx delays	
CAPABILITY 6. BROAD-AREA PRECISION NAVIGATION			
A. Satellite Navigation As Primary Means			
	(1) SatNav primary means enables reduced oceanic separation stds & increased capacity. (2) SatNav primary means enables support reduced domestic separation standards to increased capacity.	(3) CAT I approaches available on all runway ends to reduce weather delays (4) CATII approaches available at all runway ends to reduce weather delays	(5) CAT III approaches available at all runway ends to reduce weather delays
B. Ground-Based Infrastructure Reduction			

NAS to NGATS Roll Out			
Base Period 2006 thru 2010	**Initial NGATS 2011 thru 2015**	**NGATS 2016 thru 2020**	**Final NGATS 2021 thru 2025**
	(1) NDB navigation aids shutdown to reduce sustainment costs	(2) VOR/DME network reduced to reduce sustainment costs.	(3) ILS shut down at all but CATIII airports to reduce sustainment costs.
CAPABILITY 7. EQUIVALENT VISUAL OPERATIONS			
A. Low Visibility Air Operations			
	(1) CDTI enables reduced in-trail separation during approach increasing airport arrival capacity during IMC to VFR levels (2) CDTI enables independent operations on converging & closely spaced parallel runways increasing airport arrival capacity during IMC to VFR levels	(3) Self merging and spacing using CDTI reduces controller workload & increases a/c flight path flexibility under certain conditions and airspace (4) Airborne separation assurance and sequencing automation increases operations at non-towered airports during IMC to VFR levels	(5) Self separation using CDTI reduces controller workload and increases a/c flight path flexibility under certain conditions and airspace (6) Airborne automatic collision detection and resolution increase capacity and safety
B. Low Visibility Ground Operations			
		(1) Synthetic vision enables zero/zero or blind taxi capabilities reducing airport surface delays during IMC to VFR levels	
CAPABILITY 8. SUPER DENSITY OPERATIONS			
A. Reduced Terminal Area Longitudinal Separation			
		(1) Reduction of arrival/departure spacing requirements for a single runway increase throughput at high density hubs	(2) Dynamic longitudinal arrival and departure spacing based on wake vortex detection and prediction increases throughput at high density hubs
B. Reduced Terminal Area Lateral Spacing			
		(1) Reduction of arrival/departure spacing requirements for closely spaced parallels increases throughput at high density hubs	(2) Throughput at high-density hubs is increased through the implementation of coupled approaches to very-closely-spaced parallels.
C. Reduced Runway Occupancy Time			
		(1) Improved energy management during rollout and situational awareness of nearby aircraft reduce runway occupancy time and increase throughput at high density hubs	(2) Multiple aircraft operations on a single runway increase throughput at high density hubs
CAPABILITY 9. LAYERED ADAPTIVE SECURITY			
A. People			
	(1) Security is enhanced and passenger screening time is reduced with secure passenger programs		
B. Cargo			

NAS to NGATS Roll Out			
Base Period 2006 thru 2010	**Initial NGATS 2011 thru 2015**	**NGATS 2016 thru 2020**	**Final NGATS 2021 thru 2025**
	(1) Next generation explosive trace detection screening technology to improve security. (2) Security enhanced and shipper overhead reduced with known/trusted shipper programs.		
C. Airports			
		(1) Improved airport perimeter surveillance and security checkpoint design reduce terrorist threats	
D. Aircraft			
(1) Enhancements of vehicle tracking to improve security		(2) Improved airport perimeter surveillance and security checkpoint design reduce terrorist aircraft threats	
REQUIRED R&D ACTIVITIES			
A. System Enabling Research & Development			
(1) Initiate research to establish a mathematical safety analysis basis for en route, terminal, runway spacing, in trail, et al separation standards (2) Initiate research to define the optimum roles of pilot, controller, and flight dispatcher as related to each other and their machines. (3) Determine the optimum size for a NGATS facility in terms of people, airspace, etc. (4) Initiate research to define a truly fault tolerant "network centered" automation network that support very high levels of automation (5) Continue to redefine weather and wake vortex research to develop products that enable visual rules in IMC conditions and minimize approach spacing			
B. NGATS Platform, Network & Protocol Development			
(1) Define Airborne Information Web (2) Define NGATS grd/grd network	(3) Develop Airborne Information Web (4) Develop NGATS grd/grd network (5) Develop 2nd generation "Network Centered" NGATS architecture and associated 2nd generation automation platform (s) that maybe airborne, space or ground based or some combination. (6) Initiate the definition and development of the associated pilot work station (including avionics), controllers workstation, flight work station, and other workstations , if needed , to support the human roles for the future NGATS.	(7) Network sustainment research	(8) Network sustainment research
C. 1st Generation NGATS Software (ERAM/STARS/ARTS Platform)			

NAS to NGATS Roll Out

Base Period 2006 thru 2010	Initial NGATS 2011 thru 2015	NGATS 2016 thru 2020	Final NGATS 2021 thru 2025
(1) Develop automated handoff software (2) Develop automated FAA/AOC auto-negotiation software (3) Develop Data link clearance delivery software (4) Develop 4-D trajectory data link delivery software (5) Develop terminal ADS-B position and intent application software (6) Development of automated separation and sequencing from prior NASA work on airborne and ground automation (7) Develop dynamic management of SUA/TFR airspace management software (8) Develop en route dynamically configured airspace software (9) Develop 4-D trajectory software (10) Develop software for sharing weather information with users on the ground and airborne			
D. 2nd Generation NGATS Software (NEO Platform)			
(1). Initiate research & development of Optimizer/Evaluator and associated dynamic realignment of airspace.	(2) Develop Airborne Information Web Software (3) Develop 4-D trajectory negotiation software (4) Develop enhanced ADS-B based position and intent software (58) Continue development of automated separation and sequencing engines (6) Continue Optimizer/Evaluator research & development (7) Development of software for inclusion of probabilistic and deterministic weather information in decision making processes		
E. 3rd Generation NGATS Software (NEO Platform)			
		(1) Develop Air to grd information sharing software (2) Continue development of automated separation and sequencing engines (3) Continue the refinement of the Optimizer/Evaluator concept (4) Develop dynamic longitudinal arrival and departure spacing software (5) Develop coupled approach software for use with closely spaced parallel runways (6) Develop software to support multiple aircraft on the same runway	

NAS to NGATS Roll Out			
Base Period 2006 thru 2010	**Initial NGATS 2011 thru 2015**	**NGATS 2016 thru 2020**	**Final NGATS 2021 thru 2025**
F. Next-Next Generation ATS			
			(1) Begin work on the Next-Next Generation ATS System.
REQUIRED F&E ACTIVITIES			
A. NAS/NGATS Operating Facilities			
	(1) Select 4 existing ARTCCs and 50 TRACON/Towers to accommodate the ERAM platform that would drive the full complement of ARTCCs, TRACONs and Towers. (2) Determine location and begin establishment new NGATS operating facilities of appropriate size that will accommodate the NEO platform		
B. NGATS Platform, Network & Protocol Implementation			
(1) Continue development and begin implementation of ERAM based automation platform (2) Establish NGATS transition CNS transition platform from MOCA (ORCA) up over entire U.S. airspace and to the ground at selected airports with digital radio, data link and ADS-B using selected ground locations with a space based overlay. (3) Integrate transition CNS into existing NAS, STARS, ARTS platform with FTI grd/grd system (4) Implement integrated surveillance network	(5) Complete implementation of ERAM, STARS, Micro-ARTS automation platform. (6) Integrate NGATS CNS transition platform into ERAM platform	(7) Implement "Network Centered" Platform with associated pilot, controller, dispatcher, and other workstations in net NGATS facilities. (8) Implement Airborne Information Web (9) Implement NGATS grd/grd network	
C. Decision Support, Collaborative Decision Making, Information Software Tools Implementation on NAS/STARS/ARTS Platform			
(1) Implement interface with transition CNS w ABS-B position data (2) Implement Interagency information sharing software (3) Implement integrated surveillance network enabling software (4) Implement FAA/AOC information sharing software (5) Implement FAA/FBO information sharing software (6) Complete implementation of TMA and URET automation support tools into NAS, STARS, ARTS platform (7) Implement TFM modernization CDM tools on NAS, STARS, ARTS platform			
D. 1st Generation NGATS Software Implementation On ERAM Platform			
	(1) Build (k) functionality of the 2010 NAS software. (2) Build (k+1) 1st generation NGATS software		
E. 2nd Generation NGATS Software Implementation On NEO Platform			

NAS to NGATS Roll Out			
Base Period 2006 thru 2010	**Initial NGATS 2011 thru 2015**	**NGATS 2016 thru 2020**	**Final NGATS 2021 thru 2025**
		(1) Build 2nd generation NGATS software	
F. 3rd Generation NGATS Software Implementation On NEO Platform			
			(1) Build 3rd generation NGATS software
REQUIRED OPERATIONS ACTIVITIES			
A. Notices of Proposed Rule Making			
(1) Data link rule making (2) SatNav rule making (3) ADS-B rule making (4) CDTI rule making			
B. RNP Route Establishment			
(1) RNP routes established between all congested airports	(2) RNP routes established between all runway ends at congested airports	(3) Time metered RNP routes flown between all runway ends at congested airports	(4) RNP routes established between all airports served by commercial traffic
C. Satellite As Primary Navigation Means			
	(1) SatNav becomes primary means for navigation in oceanic airspace (2) SatNav becomes primary means for navigation in domestic airspace	(3) SatNav CAT I approaches available at all runway ends (4) SatNav CAT II approaches available at CAT II airport runway ends	(5) SatNav CAT III (augmented) approaches available at CAT III airport runway ends
D. Safety Management System Implementation			
(1) Proactive risk based SMS implemented			
E. Service Levels			
(1) Service levels based on user equipage and training implemented	(2) RNP approaches /departures required at congested airports	(3) Negotiated contracts between users and providers established	
F. Airspace and Procedures Review			
(1) Realign airspace and procedures to capture benefits of enhanced CNS and automation tools.	(2) Realign airspace and procedures to capture benefits of enhanced CNS and automation tools.	(3) Realign airspace and procedures to capture benefits of enhanced CNS and automation tools.	(4) Realign airspace and procedures to capture benefits of enhanced CNS and automation tools.
G. Cost Control Activities			
(1) Survey the NAS to identify opportunities to eliminate or modify existing obsolete facilities, equipment, and procedures to reduce costs.	(2) NDB Navigation Aids Shutdown (3) Survey the NAS to identify opportunities to eliminate or modify existing obsolete facilities, equipment, and procedures to reduce costs.	(4) VOR/DME network reduce from ~1000 facilities to ~400 facilities (5) Survey the NAS to identify opportunities to eliminate or modify existing obsolete facilities, equipment, and procedures to reduce costs.	(6) ILS shut down at all but CAT III airports (7) Survey the NAS to identify opportunities to eliminate or modify existing obsolete facilities, equipment, and procedures to reduce costs.